

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1889.—VOL. XLI.

LONDON, SATURDAY, NOVEMBER 4, 1871.

{ PRICE FIVEPENCE
PER ANNUM, BY POST, £1

Original Correspondence.

THE BESSEMER STEELWORKS, GLASGOW.

Of the seventeen works in Great Britain that manufacture steel on the Bessemer principle there is only one in Scotland—the Atlas Works, situated in East Milton-street, Glasgow. These works were originally constructed in 1837 as a millwrights' establishment; and subsequently Messrs. Rowan and Co., the proprietors, went into the manufacture of locomotive tyres. In the latter branch of business, however, they found themselves unable to compete with the Yorkshire and Lancashire firms, who could command a cheaper and more ready supply of Bowling and Low Moor iron, which is specially adapted for this particular class of work. When, therefore, Mr. Henry Bessemer had successfully patented his new steel converter, they determined to go into the manufacture of steel; and they were the second firm in Britain to take out a license to work the new patent—the first license having been granted to Sir John Bell and Co., of Sheffield. Since that period the Atlas Works have been carried on with great success, especially in the production of railway wheels, of which they have made a speciality, and for which they have obtained a very high repute.

Since they went into the manufacture of steel Messrs. Rowan and Co. have greatly extended their original works. Indeed, the only part of the structure now standing is a large shop, measuring 200 ft. in length by 60 ft. in width, in which railway wheels, with their axles and tyres, are finished, and adapted for the market. The machinery of this shop comprises a number of lathes and planing machines, two horizontal hydraulic presses, for pressing the wheels; and several cranes. On the occasion of a recent visit we saw in this shop several wheels, constructed on a patent taken out some months ago by Mr. Handyside, of Glasgow. The speciality of this wheel is that its disc is made of two malleable iron plates, welded together, and bent so as to form a shape not unlike the letter S. It is impossible to say whether the new wheel will supersede the invention of Mr. Mansell, the disc of whose wheel is constructed of teak wood; but Mr. Handyside claims for his patent that it is cheaper than the ordinary disc wheel, and more durable at the same time. We may mention, however, that Mr. Handyside's wheel is now undergoing a trial, and its merits will soon be fully tested. At the south end of the wheel-shop there is an engine for driving the machinery inside; while above there are a number of lighter tools in operation, and a pattern-shop. At the north end of the wheel-shop there is another engine-house. It contains a hydraulic and a blowing engine. The blowing-engine is fitted up with valves and blowing cylinders, constructed on the Bessemer principle.

The converter-house was erected in 1862, for the special purpose of carrying on the Bessemer process. On entering, the first prominent objects to strike the eye are two large 3-ton converters, made of stout boiler-plate, and lined with gannister, which is now admitted to be a more durable substance than fire-brick. The converters are mounted on trunnions, each raised on stout iron standards, and they may be turned into any required position by means of certain gearing, worked by hydraulic power. At the top of each converter there is an opening for filling it with the molten crude iron; and at the bottom there are seven fire-clay tuyeres, each having seven holes, through which the blast is admitted. Blast is admitted at a pressure of 15 to 18 lbs. per square inch, and in rushing through the tuyeres the blast produces a violent agitation of the metal, causing a combination of the silicon and carbon with the oxygen of the air, and thus eliminating the most combustible gases. After this process has been carried on for a certain time, varying from 15 to 30 minutes, the converter is tipped further forward, and the fluid steel is run into large casting ladles, and then carried to the moulds. These moulds and ladles are placed in a semicircular pit underneath the converter; and on each side of the pit there are heavy cranes, for lifting the moulds and ingots in and out. At the Atlas Works the moulds chiefly used are a patent of Mr. Rowan's, and are adapted specially for railway tyres. All the blast and water pipes in the converter-house are underneath the floor. The water pressure is equalised by an accumulator in the east corner of the building, and the blast passes through a receiver before it reaches the converters. Both the air and water pipes are brought to a focus about 20 yards from the converters, and directly opposite to them, where a man is stationed on a small platform, with valves at his command, by the means of which he can regulate everything that goes on—turning off and on the blast and hydraulic pressure, or raising and lowering the vessels at pleasure. In the early days of the Bessemer system a man had to regulate the work of the converters by standing close beside them, thus exposing himself to intense heat, and no small danger, while he could not carry on his work with anything like the same regularity and convenience. We should mention also that the converter-house is a fire-proof erection.

Next to the converter-house, and separated from it only by a brick wall, there is the department for preparing the iron for the converters. The iron is melted in an air-furnace, or cupola, with a steam-jet instead of a fan, before being run into the converters. In one corner of this building there is a Siemens furnace, which was constructed with the idea of making steel direct from the ore, but as the experiment did not succeed the furnace has been in disuse ever since. For some time, however, there was a Siemens furnace in operation, but it had to be removed to make way for the apparatus now used in connection with the Bessemer process. The producer is still left, and can be adapted to the use of a Siemens furnace at any future time. There is a row of six cylindrical multitubular boilers in this department, each boiler containing 45 tubes, and fitted with pipes at the back for allowing of the proper circulation of the water. There is a small donkey-engine close at hand, for feeding the boilers, and any boiler can be cut off at pleasure.

To the west of the boiler-house, and under the same roof, there is a forge, of small dimensions, containing two of Condie's steam-hammers—the one 5 tons and the other 35 cwt. The 5-ton hammer has been modified by Mr. Rowan to such an extent that it is entirely unlike, except in appearance, to Mr. Condie's plan. This improvement has been patented by Mr. Rowan, and consists in dispensing with the hollow piston rods of the Condie hammer, by the use of a solid piston rod, and providing for the introduction of the steam by pipes that enter the top of the moving cylinders. The pipes are fixed to the entablature of the hammer-frame, and pass through stuffing-

boxes in the cylinder top. Owing to this arrangement, the hammer works with unusual rapidity for its size and length of stroke.

In the smithy, which is just a continuation of the forge, there is a vertical tyre-mill for rolling tyres and spokes, driven by a little donkey-engine. Close at hand there is another small engine, used to drive the Schulze fan in connection with the smithy. We believe that Mr. Rowan was among the first to construct a tyre-mill on the vertical principle. There is a second mill of similar construction at the entrance to the smiths' shop, the one mill being used for "breaking down," and the other for finishing. The engine and gearing of the second mill are all invisible, being below the surface of the ground. Both mills are powerful and noted for their speed. In another part of the smiths' shop we came upon a steam-hammer, which was formerly used for welding iron tyres, so as to prepare them for the mill when the old system of finishing the tyres was in vogue. This hammer is interesting, as the first that was ever applied to this purpose, the anvil being specially shaped to suit the tyres. In the smithy there is also a spoke-bending machine, with engine attached, that was patented some years ago by Mr. Rowan.

There are a number of auxiliary departments, including a small foundry, with two cupolas in connection with the Atlas Foundry, but nothing about them calls for any special mention. There are sometimes from 50 to 60 sets of wheels turned out weekly from the Atlas Works, and at the present time the firm have plenty of work on hand. It is only fair to Mr. Rowan to add that he has always been most eager and ready to put any new invention, whether of his own or another, to a practical test, and there are few establishments with more real mechanical novelties about them.

BIRMINGHAM, AND THE BLACK COUNTRY—No. XV.

THE ROUGH HAY BLAST FURNACES.

These furnaces are situated near to Darlaston, and are the property of Messrs. ADDENBROOKES, SMITH, and PIDCOCK, who are also the owners of extensive collieries surrounding the furnace plant. The latter is deservedly worthy of notice, as there is in vogue all the more modern and most approved appliances for obtaining economical results. The gentlemen composing this firm are not stumbling blocks to the advancement of science, for whilst having a due regard to the caution necessary to prevent needless expense, incurred by running after and adopting every new-fangled notion which may be nicely gilded over, and show remarkably well in theory, but yet be exploded by a thorough practical test of very short duration, they have the common sense, the business tact, and the requisite knowledge of their branch of manufacture, to guide them in choosing those plans and adoptions that really tend to economy and the carrying out with facility of the various operations.

It may, however, be supposed that we are passing eulogiums somewhat too high upon the proprietors of these furnaces, but such is not the case, for what we have laid down is a standard that all ironmasters should come up to, and one which has been attained by nearly the whole of those in the Northern districts, but by comparatively few in South Staffordshire. It is because in this central hive of industry so much ridiculous prejudice exists, that the firm of Messrs. Addenbrookes, Smith, and Pidcock stands out in somewhat bold relief, for they have not only readily adopted those improvements that have had for their object the saving of fuel and labour, but they have led the way in many important innovations. Mr. Addenbrooke is the inventor and patentee of what is acknowledged to be the best open-top system of utilising the waste gases from the blast-furnaces, and which is almost generally adopted throughout the Black Country. If we mistake not, the first kiln put up in this district for calcining the mine was erected at these furnaces. It was thought that burning in kilns was not suitable for the native clay-binds, and that they would scaffold or conglomerate together in such a way as to prevent their egress from the kiln at the bottom. A brief trial at these furnaces showed that this was not the case, and the plan came to be pretty freely adopted. We have made an accusation that will, perhaps, be felt rather derogatory to the characters of the ironmasters of the Black Country. From our experience we are sorry to say that the cap will fit far too many of them. Great improvement has been manifest of late years, but this has been to a great extent due to the severe competition they have to encounter from the younger and more forward districts. As long as fuel and ore could be got in abundance, and at a cheap rate, and the Cleveland ironmasters were not coming forward with such rapid strides, nothing could prevail upon the masters and managers to alter their old-fashioned way of working. It must have been a wonderful invention that could have passed in those times—first the prejudice of the master, then that of the manager, and last, though a long way from being the least, that of the men. We do not mean to insinuate that this was the case with all the proprietors of ironworks and blast-furnaces, for there were a few bright exceptions, but they were in many instances overpowered by the thick-headed managers and ignorant men.

The managers in South Staffordshire have been, and are yet to no small degree, a class of men who possess nothing but a practical knowledge of their business without the smallest amount of theory, and who upon principle set their face against anything new that they do not originate themselves, and it is hardly possible for them to supply to the iron-making world any new idea of much value, having to feel their way, and being void of theory. Some of them are so practical that for them to really understand any good new theory would necessitate a surgical operation, as Johnson says of the Scotchman and a joke. It is not our intention to despise practice, for we can fully well estimate its value, but with it we would have common sense, less prejudice, and some amount of theory. This state of things, although existing far too strongly and too widely, is on the decline in Staffordshire; something more than competition has worked upon the minds of the ironmasters, they have been cultivated and raised, and a sort of thirst has been generated for knowledge respecting the various branches of the manufacture of iron. This cloak of conservatism has been rolled away to a great extent by the several institutes and associations which have brought the masters and managers into social intercourse one with another, and the many views on different subjects have been expressed and compared to mutual advantage. The Iron and Steel Institute in the short time it has been established has done more to further this object than any other, and the recent meeting in Staffordshire made on impression that will not easily be forgotten. We are led to speak

thus strongly on this subject, and show it in its worst colours, that those concerned may see themselves as others see them, and with the hope that improvement in these respects may be still more rapid.

Under the guidance of Mr. Milward, the engineer, we recently inspected the Rough Hay Furnaces. The plant is well arranged, but not so compact as it would have been had the whole been put down at one time; it is good, when taking into consideration the fact that part is old, and portions have been added time after time. There are three furnaces, two of them built of brickwork, bound with iron hoops, and the other recently erected of wrought-iron, encased with fire-brick. The two brick furnaces are about 50 ft. high, and were both 14 ft. diameter in the boshes, but one of them has just been increased to 15 ft. diameter. They have circular arched bottoms, in which a passage is provided for getting round quickly to the tuyeres. In the furnace that has been altered the hearth has been separated entirely from the brick pillars supporting the cylinder of the furnace, and by this arrangement the expansion of the brickwork of the hearth and bottom of the bosh will be prevented from bulging, or injuring in any way the pillars. It also allows the pipes and connections for conveying the blast to the tuyeres to be put up in a more simple and direct form. The material is conveyed to the tops of furnaces by a double lift, working in a brick structure. A small vertical engine placed between the lifts gives motion to a drum to which the two platforms are connected by means of chains. To each furnace there is a large hot-air oven or stove, containing 24 double cast-iron pipes, 12 in. diameter. The blast is supplied from these to the furnaces at so high a temperature that the swan necks, or pipes adjoining the tuyeres, are red hot. The native argillaceous iron ores, or clay-band stones, alone are used, with the exception of now and again a small portion of Pottery, or North Staffordshire mine. The ironstones are calcined in three large brick kilns, bound with wrought-iron hoops.

As we have before remarked, one of these was the first kiln put up in the district, and we have repeatedly shown the economy of both fuel and labour brought about by this method of treating the mine. These kilns are fitted with hoppers at the bottom, into which the stone, when calcined, rolls, and by means of a sliding door is loaded into the barrows. An incline is constructed upon which the material is conveyed to the tops of the kilns. A small vertical engine draws the wagons up the incline. The two boilers to this engine also supply steam to the furnace lift engine, and the one driving the stone-breaker. The Welsh and the native Silurian limestones are used as fluxes, and are not broken by hand, as at most places, but by one of Blake's stone-breakers. This machine is erected on a wooden framework, at some distance from the ground, so that there is adequate room underneath it to load the stone into barrows. We think it would save labour were a hopper placed under the machine to catch the stone, from which it could be loaded into the barrows by merely opening a sliding door. Mr. Milward has fixed a drum at the top, near the machine, which is worked from the same engine, and draws the stone up a small incline from the wharf, and it is then tipped into the jaws of the breaker.

The new furnace, which is quite equal, if not superior, to any other in the district, is, as we have before stated, built of bricks, surrounded by a wrought-iron casing, and the yield from it is about 230 tons per week. It is 50 feet high by 15 feet in diameter in the bosh, and is supported upon cast-iron columns. In the ordinary method of building furnaces upon columns a cast-iron ring surmounts the latter and supports the brickwork, but here the ring is of wrought-iron, with flanged joints, and brick arches are built from column to column, and in this manner the entire weight of the superincumbent mass of brickwork is brought directly upon the tops of the columns thus making the whole fabric more substantial. The tunnel head is of wrought-iron, and stands upon small cast-iron pillars, and gives a good finish to the furnace. The arrangement for conducting the blast to the tuyeres is excellent, a wrought-iron pipe thickly lined with fire-brick surrounds the furnace immediately above the tuyeres, and inside the columns. The ordinary cast-iron connections pass from this to the tuyeres, and the blast is conveyed to it from the ovens through another wrought-iron pipe, also lined with fire-bricks. Cast-iron pipes are ordinarily used in these positions, but this plan will better retain the heat, keep the blast hotter, and prevent any liability to leakage from the warping or twisting of the metal. There are two blast-engines, each having steam-cylinders 45 in. in diameter, blowing-tubs 50 in. in diameter, and a stroke of 8 ft. The two engines are coupled together at the steam-cylinder end. The beams are projected in upward curves, to which large connecting-rods are attached, and are coupled at the other ends to two cranks, having on the shaft between them a 20-ton fly-wheel. These engines are well fitted and equally balanced, and require very little repairs; they were made by the engineer of the firm in a small shop near the furnaces, in which all the engines connected with the furnaces have been constructed.

The steam for the blast-engines is generated in six large boilers, and supplied to the engine at a pressure of 12 lbs. to the square inch, whilst the vacuum is 12 lbs., and the pressure of blast 4 lbs. The waste gas from the tops of the furnaces is taken off upon Mr. Addenbrooke's own principle, and heats the whole of the boilers and hot-air ovens. The gas is drawn off through cast-iron framed openings, into a flue made in the brickwork, and surrounding the top of the furnace. The openings in the cast-iron frames or boxes are made of such a slope that nothing but light dust can be carried through them by the gas from the interior of the furnace. The outside of the external flue which surrounds the top of the furnace is composed of wrought-iron plates, lined with fire-brick, and a series of openings are made in this wrought-iron casing, and covered with movable doors or lids, and through these the accumulated dust can easily be removed. A light iron gallery surrounds the flue. The gas is conveyed from the circular flue at the furnace top, through large valves, into a wrought-iron main, 7 ft. 6 in. diameter, lined with fire-bricks, and from thence through other flues to the ovens and boilers. The valve is used for regulating the supply of gas or shutting it off altogether, should the material in the furnace get low; for air drawn through it into the flues or main would cause combustion, and consequently, much injury to the apparatus. The advantages gained from the use of this open top method of utilising the gas are an increased and more regular yield of iron, and a saving in the wear and tear of the boilers and ovens, which last much longer with the regular heat of the gas. The apparatus is simple, and little liable to derangement, requiring but a small amount of care and attention.

With this system there is no fear of back pressure, and the whole of the gas is not taken off, but a little is allowed to burn at the top and prepare the material, by warming and drying it, thus saving about 10 per cent. of fuel. The material cannot vary in its level, or the whole will soon come to a stand, and thus little derangement is caused to the working of the furnace. A large stack is, of course, necessary to draw off the gas through the openings into the flues, or it would nearly all escape at the top.

THE INSTITUTE OF CIVIL ENGINEERS.

It is announced that the first ordinary general meeting of members will be held on Tuesday, Nov. 14, and that the meetings will be continued thereafter till the end of May, with the exception of the last Tuesday in December, the first Tuesday in January, and the Tuesdays in Easter and Whitsun weeks. The annual general meeting, to receive and deliberate on the report of the council, and to elect the President, four vice-presidents, and 15 other members of council for the ensuing year, will take place on Tuesday, Dec. 19. The members have been invited to send in any original communications they may have prepared for reading at these meetings, and have been reminded that applications for admission from candidates desirous of joining the Institution can now be considered and dealt with.

During the last three months of the recess the Society has lost by death one honorary member—F. M. Sir John Burgoyne, G.B.C., &c., who was elected on Feb. 12, 1839; five members—Messrs. Joseph Hamilton Beattie (1857), John George Blackburne (1855), Robert Benson Dockray (1843), Albinus Martin (1849), and Josiah Parkes (1823); and three associates—Messrs. Arthur Field (1869), Edward Moseley Perkins (1843), and Henry Beadon Rotton (1867). There are now on the books 14 honorary members, 725 members, 1056 associates, and 205 students, making a total of 2000 of all classes, as against 1000 on Nov. 30, 1862.

INSTITUTION OF MECHANICAL ENGINEERS.

The general meeting of members of this Institution was held on Oct. 26, in the Lecture Theatre of the Midland Institute, Birmingham—Mr. John Ramsbottom, president, in the chair. The secretary (Mr. W. P. Marshall) having read the minutes of the previous meeting, several new members were elected, and the officers of the Institution were nominated by the meeting for the next annual election.

The first paper read was a "Description of Miller's Cast-iron Steam Boiler," by Mr. John Laybourne, of Newport, Monmouthshire. This boiler is composed of a series of cast-iron sections, of two patterns only, each of comparatively small size, so as to contain only a small quantity of water; those at the front end form a succession of arched tubes over the fire-grate; and the rear sections consist each of five vertical tubes, united by a transverse horizontal tube at top and bottom, and placed with the tubes in each section opposite the spaces in the next. The whole of the sections of both patterns are bolted together by flanged joints at the bottom, each section having a communication through the bottom joints with the adjoining sections on either side; and a smaller wrought-iron pipe from the top of each section conveys the steam to a main steam-pipe, common to the whole boiler. All the joints are protected from the action of the fire, those at the bottom being below the fire level, while the joints at the top are in a chamber above the top of the flue. For the purpose of ensuring efficient circulation of the water in all portions of the boiler, the arched sections at the fire end are cast with a longitudinal mid-feather in each leg, by which the ascending current of heated water on the inner side exposed to the fire is separated from the descending current of cooler water on the outer side; and in the rear sections the vertical tubes have an internal circulating tube placed within each, the heated water ascending through the outer annular space, and the cooler water descending within the circulating tube. All the sections of the boiler are left free to expand with the heat, the rear sections being attached together by only a single central joint, and the wrought-iron steam-pipes at the top are long enough to allow of yielding to the requisite extent; the arched fire-box sections are attached to the rest of the boiler on one side only, and are free to expand on the other side. No case has occurred of explosion with any of these boilers; and in the very few instances in which accidental fracture of the cast-iron has taken place the only result has been that the water contained in the boiler has flowed out through the crack, without causing any damage beyond putting the fire out. By means of the flanged joints, a broken section in any part of the boiler can be readily removed, and replaced by a new one, without disturbing the rest of the sections, which are all duplicates of one another. Specimens were exhibited of fractured pieces taken from the boilers, illustrating the harmless nature of the cracks occurring in the cast-iron, and showing also that the quality of the metal remained unimpaired after more than two years' working. The boilers are kept clean by blowing off at regular intervals, according to the quality of the feed water, and any deposit accumulating in the bottom portions is raked out whenever necessary, by taking off the bottom covers at the ends of the boiler. As the total quantity of water contained in the boiler is small, in proportion to the extent of heating surface, the water level is in some cases maintained at the required height by means of a self-acting feed apparatus, consisting of a hollow ball suspended from the arm of a lever controlling the feed cock; two pipes extending some distance horizontally communicate respectively with the top and bottom of the ball, the former terminating at the high-water level inside the boiler, and the latter at a lower level. As soon as the water-level rises and covers the orifice of the upper pipe, the steam previously contained in the ball becomes condensed, and a vacuum is formed; and the ball then becoming filled with water entering from the boiler, depresses the lever, and shuts off the feed. When the water-level falls again below the orifice of the upper pipe, the water runs back out of the ball into the boiler, and a counterpoise upon the lever raises the ball and turns the feed on again. One of these cast-iron boilers has now been at work for two years and a half at the writer's works with complete success, and with an important economy in fuel. Several other boilers of the same construction are also in use at other works, and have proved entirely satisfactory. The particulars were given of a series of experiments made to test the evaporative power and economy of the boiler at the writer's works; and the average duty amounted to nearly 11 lbs. of water evaporated from 100° temperature of feed per lb. of Rbbw Vale coal.

Mr. COCHRANE was of opinion that experience only was needed to show that cast-iron could be used in the construction of boilers in such a way as to make it quite as useful and suitable as wrought-iron.

Mr. TOMLINSON, whilst approving of the general idea and construction of the boiler, was of opinion that certain openings with the plan involved were far too close; he could have obtained much greater results if the openings had been 3½ in. wide. The circulating tubes might with advantage be done away with, or at any rate made considerably smaller.—Mr. MARTIN recognised the careful manner in which details had been wrought out in the construction of the boiler, which was a great improvement upon the same style of boiler in use in America; but at the same time he had a very great distrust of cast-iron used in making boilers.

Mr. LAYBOURNE said about thirty of these boilers were now at work in different parts of the country; eight were working in one building in South Wales. As to the results of their working in America, he had no information whatever. The cost of construction was about the same as that of the ordinary wrought-iron boilers. The reason of this was that the casting was expensive. For the satisfaction of an insurance company, one of the boilers had been worked at a pressure of 200 lbs. There was about the same amount of incrustation as in ordinary wrought-iron boilers.

Mr. R. WILLIAMS expressed the opinion that at the end of four or five years a cast-iron boiler would be altogether useless.—The CHAIRMAN, in closing the discussion, said the means best calculated to enable boilers to carry a high pressure with safety was a subdivision of the water into small portions. This appeared to have been done in Miller's boiler. He trusted it would be as successful as it deserved to be.

The next paper was "On Steam-Pressure Gauges," by Mr. ERNEST SPON, of London, communicated through Mr. Chas. Cochrane. The reliable construction of steam-pressure gauges is of much importance in connection with the safe working of steam-boilers, a great number

of the spring-pressure gauges in ordinary use having been found inaccurate, either from defects in original construction, or in consequence of their becoming unreliable when in constant use. In the Bourdon gauge, which is the spring-pressure gauge, that has been the most extensively used for a great number of years, the indication of the pressure is obtained by the employment of an elastic metallic tube, bent to a curved form, which when subjected to internal pressure becomes less curved, and the resulting movement of the free end of the tube communicates motion to an index upon a dial through the intervention of a lever, or a toothed sector and pinion. The elastic tube, however, is liable to become permanently strained by continued use, or by accidental exposure to an excess of pressure, and the indications of the gauge are then no longer correct. In the Schaeffer gauge the pressure is measured by the deflection of a circular corrugated steel plate, fixed round the circumference, and bulged in the centre by the pressure, the extent of the bulging being magnified upon a dial by means of a toothed sector and pinion. This gauge, though it has been considered one of the best in use, has a disadvantage in the very small range of deflection of the plate under the pressure, requiring the motion to be very largely magnified upon the dial, whereby any errors are also proportionately magnified. The plate is also liable to be permanently strained by an excess of pressure, and is, moreover, liable to crack when continually worked. The metal of this plate being very thin, as is also the case with the elastic tube of the previous gauge, its elasticity is liable to be diminished when any oxidation takes place, and error in the indications is then the consequence. The pressure is also measured by the bulging of a circular steel plate in Wallis's gauge, but the deflection is increased by the plate being cut into five segments by radial slits, and a thin brass diaphragm, or a sheet of vulcanised india-rubber, is used to cover the slits on the side exposed to the pressure. The brass diaphragm, however, is found too rigid to admit of the requisite sensitiveness in the gauge, while the india-rubber is liable to get forced into the slits by the pressure, thereby obstructing the action of the gauge. A solid piston working in a cylinder is supported against the steam-pressure by a steel spring in Miller's gauge, and is rendered steam-tight in the cylinder by an india-rubber diaphragm, which is fixed round the circumference between the flanges of the cylinder; the motion of the piston is communicated to the index by means of a short chain, coiled round the spindle of the index, and attached to the arms of a vibrating bow, which is actuated by the piston-rod. The motion of the piston is limited to a very short range, owing to the risk of the india-rubber diaphragm getting cut round the edge of the piston with a longer action, and the construction of the multiplying gear for the index involves objectionable complication. In Smith's gauge, which has been extensively used, a steel volute spring is employed, and is acted upon directly by the steam on one side, being covered on that side by an india-rubber diaphragm secured round the circumference to make a water-tight joint. This spring has a considerable range of action compared with the gauges previously noticed, and being of considerable substance is not liable to be affected in strength by corrosion; the deflection of the spring moves the index by means of a rack and pinion. Three concentric spiral springs, placed one within another, with their ends covered by an india-rubber diaphragm, are employed in Silvester's gauge, which is similar in principle to the last one, and the motion is communicated to the index by a rack and pinion. There is, however, an objection to the employment of a rack and pinion for actuating the index of a pressure gauge, on account of the play occurring in toothed gearing; and in Foster's gauge, in which the pressure is measured by the deflection of a volute spring, covered by an india-rubber diaphragm as before, the movement of the spring is transferred direct to the index by means of a stud fixed to the centre of the spring, and working in a spiral groove in the spindle of the index. This pressure gauge has been found by the writer to be superior to the other gauges in use in regard to durability, accuracy, and sensitiveness. The strength of spring employed is proportionate to the limit of pressure to be measured, the total range of deflection being the same in each case. Specimens were exhibited of the various gauges described, and the action of some of them was shown by means of a force-pump.

Mr. MARTIN said it was the experience of almost everybody in the district that gauges could scarcely ever be relied upon. When explosions had occurred gauges had been tested, and it had been found that they had been deceiving those who had worked by them. To such an extent was this the case, that he now carried an indicator-barrel, and trusted to the magnifying glass to secure the correct return.

Mr. SPON explained the working of the gauge his paper advocated; and

Mr. HAWKLEY, speaking of the working of steam-gauges at an extremely high pressure—(say) of 1000 lbs. to the inch—said that his experience in these cases had certainly not been very favourable to the diaphragm gauges. In many cases he had employed the old, and now forgotten, form of gauging by a column of air pressed upon by a fluid; he had found this to work satisfactorily. The system of graduating was, of course, difficult, but by no means insuperable, and, as a rule, a direct and reliable result could be obtained from the use of the system.

Mr. VALLANCE and the CHAIRMAN concluded the discussion by some general remarks on the subject of steam-gauges.

OUR COAL SUPPLY.

SIR,—Though the very suggestive letter of "A Mining Engineer," in the Supplement to last week's Journal, is in the main correct, there is one point on which he can, I think, be shown to be mistaken. He disputes the probability of our being able to work coal at a depth of 4000 ft., as assumed by the late Commissioners of Enquiry, unless at a cost for reducing the excessive temperature of such depth which may be so great as to be prohibitive. Of course, it may be, but the question is whether it is likely to be so, and it is exceedingly unlikely.

I do not agree with "A Mining Engineer" that the cost for labour in coal-getting at depths approaching to 3000 ft., with a temperature of blood heat, would not be very greatly increased. When I was in the hot level of a mine not much higher than that I nearly fainted from heat and closeness, and the men's work is so much interrupted by the necessity for leaving the level at short intervals for fresh and cool air that the cost of labour is at least double that in levels as close, but more cool. The amount of work that men can do in very hot weather is much less than in cold weather, and it is, therefore, certain that, if coal is to be got at great depths, either the temperature must be reduced much below blood heat, or the cost of labour be very considerably enhanced. There is, however, no difficulty in so reducing the temperature, and that by very simple and inexpensive means.

It is not so generally known as its importance deserves that power may be transmitted by compressed air in pipes to a considerable distance with little loss except that from escape of heat. When air is compressed it becomes hot, and if, after the excess of heat is lost, the air expands again it is very cold. Several ingenious contrivances have been adopted for working coal-cutters in the mine by power conveyed into it from an engine compressing air at the surface. I have seen one of these working, invented by Mr. William Firth, the air escaping from which was at 34°, which, mixing with the other air in the mine, quickly reduced its temperature to a pleasant degree of coolness. There is a very strong probability that the substitution of coal-cutting by compressed air-machines for hand labour will be economical, force the product of fuel being far cheaper than force the product of food, and that by employing the former, with man's skill and intelligence to direct it, coal will be got cheaper, and the gettars of it be better paid; but, whether that anticipation be realised or not, it is certain that power may be transmitted into mines to perform any work that needs doing there—e.g., pumping water or drawing coal—by means of compressed air, which, when it expands in the mine, will be cold, at little more loss of power than is due to the difference of temperature.

Even, therefore, if coal-cutters worked by compressed air should not succeed, as I feel sure they will if fairly tried in some form, there can be no difficulty in working pumps by power conveyed from the engine through an air-pipe, instead of by costly and clumsy pump-ropes; and all that will be necessary to keep a mineshaft worked, however deep, as cool as is desired, will be to adopt this plan for supply-

ing it with cold air, and passing that air through numerous and short air-courses, so that it may not become either unduly heated or unsafely charged with gas, an improvement already needed for safety and economy. If it be objected that the loss of power by transmitting it by compressed air would be too great, I reply that that loss is not great, and if it were it could easily be more than saved by burning coal in colliery pumping-engines as economically as it is burnt for pumping-engines in Cornwall, where it is common for steam power to cost less, coal being very dear, and, therefore, very carefully used, than it costs in most districts where coal is very cheap and, therefore, very carelessly wasted.

For my part I do not fear coal becoming so dear as to impede the national progress—first, because I do not believe it will become scarce; secondly, because I know that very much of that now burnt is wasted, and that with far less than the coal now consumed as much as is now done might be done if those who make our fire-places and furnaces had a little more common sense and would use it. Our houses might be better warmed, more steam raised, more metal made and worked, and much coal saved. This letter is already too long to justify me asking for space to show the proofs of this conviction, which are, moreover, familiar to most who are acquainted with the subject.

P. H. HOLLAND,
Late Member of a former Mine Commission.

THE PARKIN JEFFCOCK MEMORIAL.

SIR,—If any of your readers feel an interest in the Memorial Church now in course of erection to the memory of my late brother, I should like, by your kindness, to inform them that I am anxious to place an east window in the church, representing Shadrach, Meshach, and Abednego in the fiery furnace—"Lo, I see four men loose, walking in the midst of the fire, and they have no hurt; and the form of the fourth is like the son of God" (Daniel iii. 25)—as a not altogether inappropriate representation of the circumstances of the self-sacrifice of the exploring party at the Oaks Colliery explosion. The window will cost about 80*l.*, and will be executed under the direction of the architect, Mr. Brooks. I should be happy to receive any small sums.

JOHN THOMAS JEFFCOCK,
Wolstanton Vicarage, Stoke-on-Trent.

SAFETY FOR COAL MINERS—COST OF BORING VENTILATORS.

SIR,—Referring to my suggestions in the Supplement to the Journal of Oct. 14, it may be practicable to bore holes of 2 ft. diameter in or over coal mines for ventilation, and in advance of the workings, to facilitate the escape of gas. I beg now to submit the cost of making and of tubing such bore-holes, from data which Messrs. Mather and Platt have obligingly furnished me with. I leave the judgment of the merits of the question to competent persons.

Rate of Boring.—Once when abroad I was obliged to employ the old plan of boring with iron rods and a windlass. Finding that we were making little progress, I dismissed an obstinate borer, and took upon myself the superintendence of that branch of the work. I partially adopted the American plan, employing a beam and fulcrum to strike the blows when cutting rock, and a rope to shell or clear out the bore-hole. By that means I trebled the work done per day. Now, as Messrs. Mather and Platt's machine has a flat rope on a winding-drum of 10 ft. diameter, and there are no rods to shift, it is evident that the work must progress much faster than by the plan which I adopted. The following details from a paper read by Mr. W. Mather before the Institution of Mechanical Engineers at Birmingham, on Nov. 4, 1869, will show what this machine has done:—At Middlesbrough a bore-hole of 18 in. diameter was made through red sandstone, clay, white sandstone, marl, and gypsum, to the depth of 1312 ft., in 540 days, giving an average of 2 ft. 5 in. per day of 12 hours, including 150 days delay for pumping out water, &c.; the first 600 feet were bored at the rate of 6 feet per day. No tubing was employed. At Norwich a bore-hole beginning at 2 ft., ending at 18 in. diameter, was made to the depth of 1184 ft., in chalk and large flints, the last much impeding the progress of the work. In 616 days, including all delays, the average per day was 1 ft. 11 in. The first 420 ft. were bored in 26 days, averaging 16 ft. per day, and the first 900 ft. in 130 days, giving an average of 7 ft. per day. At Ferry Hill the Wardale Iron Company bored 303 feet in the coal measures, at the rate of 9 ft. per day. Other borings in the coal measures averaged from 1 ft. 6 in. to 4 ft. 2 in. per day. We may compare the above rate of boring with the old method of boring with rods and steam power by what was done by the Metropolitan Board of Works at Crossness, to procure water for the pumping-engines, as stated in the *Engineer*, at a cost of 6500*l.* I since learnt as follows: That the bore was made 18 in. at top, diminishing to 3 in. at bottom, and was bored to the depth of 930 ft. in two years and a half; that the boring alone cost 3600*l.*; the strata were gravel, chalk, and blue clay. Only 300 ft. of the hole was tubed.

The Cost of Messrs. Mather and Platt's Machinery and Plant.
A patent earth-boring machine, with 18 in. percussion cylinder, winding-engine, &c., &c. £1212 0 0
A 15-horse power steam boiler, with all fittings complete 1212 0 0
A complete plant of tools, &c., &c., for boring holes of 24 in. and 18 in. diameter, to the depth of 1200 ft.; weight about 25 tons 188 0 0
Cost of a large movable shed, timber, carriage of plant to place, say 188 0 0

Total outlay of capital for plant, &c. £1400 0 0

Cost of Boring per day, counting 312 days in the year.
Depreciation of plant, 10 per cent. per annum on 1200*l.* is 140*l.*, or per day 20 0 0
Interest on capital at 5 per cent. 0 6 0
Wages of five men the week 8*l.*, per day (four men can work the machinery) 1 6 0
Fuel for all purposes, 1 ton of slack coal 0 2 0
Oil, &c., for machinery 0 2 0
Sundries, and unforeseen expenses (say) 0 2 0

Cost of boring per day of 12 hours £2 18 0

As an example we will take an extreme case of slow boring in the coal measures 1200 ft. deep.
Say first 600 ft. at the rate of 2 ft. 6 in. per day, or 240 days
The next 300 ft. " 1 ft. 6 in. " or 300 days
" 300 ft. " 1 ft. 0 in. " or 300 days
1200 ft. 740 at 2*l.* 13*s.* = £1958 0 0

Cost of Tubing the above Bore-hole.
800 ft. of 2 ft. dia. tubing, at 1*l.* 13*s.* per foot £1320 0 0
400 ft. of ditto, at 1*l.* 7*s.* per ft. of 18 in. diameter 840 0 0
Two bell mouths, 3*l.* 3*s.* and 3*l.* 18*s.* 7 1 0
One steel driving shoe 4 9 0
Two pairs of wrought-iron clamps, 7*l.* and 8*l.* 15 0 0
Say carriage to place, and extra labour 55 10 0 = 1940 0 0

Total cost of a 2 ft. dia. bore-hole, 1200 ft. deep, with cast-iron tubing £2898 0 0

At Norwich, of a 2 ft. diameter hole, 900 ft. of it were bored in 130 days, at 2*l.* 13*s.*, is 344*l.* 10*s.*; and the whole depth, 1184 ft., were bored in 616 days, at 2*l.* 13*s.*, is only 1632*l.* Machines and plant are let out to hire, but I find that the cost of boring comes much higher by that plan.

J. DEACON.

PAYMENT OF TRIBUTERS.

SIR,—Although it is unquestionably true that accurate results cannot be hoped for if we start upon the false assumption that a 6½ per cent. ore is a 6 per cent. ore, it appears to me quite unnecessary to consider the price per ton of ore after taking the trouble to calculate the fine copper in each parcel. The contents of fine copper is 0.1260, 0.8481, 0.5245, 0.4161, 0.6179 respectively, making 2.5326 tons of fine copper in all; and as the parcel sold for 132*l.* 15*s.* 9*d.*, it follows that the smelters paid 52*l.* 8*s.* 7*d.* per ton of metal in the ore for what we may consider to be ore of 6½ produce. Now, if the metal in 6½ produce ore be worth 52*l.* 8*s.* 7*d.*, the value of a ton of metal in the ores of the other producers will be about 53*l.* 4*s.* 5*d.* for 7½, 50*l.* 17*s.* 2*d.* for 5½, 54*l.* 1*s.* 2*d.* for 8½, 53*l.* 9*s.* for 7½, and 52*l.* 14*s.* 2*d.* for 6½. Then, if we multiply the prices for metal in ore by the fine copper in each tributer's ore, we find that the several men's ores are worth—No. 1, 6*l.* 14*s.* 1*d.*; No. 2, 43*l.* 2*s.* 8*d.*; No. 3, 28*l.* 7*s.* 1*d.*; No. 4, 22*l.* 4*s.* 9*d.*; and No. 5, 32*l.* 11*s.* 5*d.*, making 133*l.* 0*s.* 0*d.* in all. But this is 4*s.* 3*d.* more than we have to divide, so we deduct one halfpenny (not 1*d.*), in the 1*l.* from the calculated amount for each parcel; but, as this would leave us 1*s.* 3*d.* in hand, we first add 3*d.* to each total, which gives us 6*l.* 14*s.* 43*l.* 1*s.* 2*d.*, 28*l.* 6*s.* 2*d.*,

221. 4s. 14d., and 321. 10s. 8d. — 1321. 15s. 9d., and each man will be well satisfied, because he has received rather more (since he loses no fractions) than he would have got if his ore had been sold to the smelter as a separate parcel.

When the calculation is made in this way, the price of the metal in the ore being, of course, thrown into decimals to facilitate the multiplication, and the products reconverted, the whole process can be performed in 10 minutes, although there are really six separate sets of calculations to make; and I maintain that the results could not be obtained in three times the time with the best and most complete sets of "ready reckoning" tables in existence, or that could be constructed, based upon the principle of first finding the standard, then the price per ton of ore, then the value of the parcel, and, lastly, settling the differences. The idea that time is saved by the use of ready reckoning tables is erroneous, and if the miners and mine agents be taught the ordinary business mode of making such calculations they will have the advantage of finding out what they want to know without loss of time or temper. — Oct. 25.

THE COPPER TRADE, &c.

SIR.—At last the ruinously low price of copper is beginning to tell upon the Chilean mines, as well as upon the mines in most other parts of the globe, from the fact that the exports of copper from that country appear to be falling off considerably of late. The great drop in the standard of copper in Cornwall and Devon, after the panic of 1866, from about 150*l.* to something below 100*l.*, caused the suspension and ultimate stoppage of a vast number of mines in Great Britain, as well as in other parts, many of which had been enormously rich and profitable a few years previously; but, luckily for Cornwall, it appears to succeed that of copper in many of the mines in depth, otherwise the result would have been fearful in the extreme for that county. The once enormously rich mines in the Island of Cuba gave way to the pressure, as well as some of the oldest and richest mines in Australia, the United States of America, the Canadas, &c. One extreme we find invariably succeeds or follows another. Immense losses are said to have occurred latterly in the working of some of the extensive mines in Chili, as in other parts of the world.

The copper market, from some cause, appears to have been overstocked during the last few years, consequently the ruinous prices obtained for the article. Lead has kept nearly steady in price, with all the rich discoveries recently made, but tin has had an unprecedented advance, without a parallel in the history of commerce; and iron, the most useful of all metals, is a good price, and remunerating to the proprietors of every grade. It is to be sincerely hoped that the price of copper will shortly be in the ascendant once more, and cause some additional activity in districts almost dormant, owing to the shutting up of so many mines, and villages almost depopulated for want of employment. The high royalty or dues demanded in Great Britain is said to be the great objection raised by capitalists to their embarking more extensively in mines in the United Kingdom. The landed proprietors will, doubtless, do well to consider this matter more seriously for the future.

A. BENNETT.

WITH WHAT ARE THE STRATA ABOUT PRODUCTIVE COPPER LODES MINERALISED?

SIR.—I crave your permission once more to make a few remarks on the above subject, and also to reply to Mr. Williams's letter, which appeared in the Supplement to last week's Journal. You have been very kind and patient in publishing several communications relating to this very important question, and I have no doubt but that all connected with mining operations will feel greatly obliged for the space allowed for the full expression of opinions and statements of facts bearing on the case. However, as yet the letters that have appeared since Mr. Payne re-opened the question seem to me to deal most more in side-issues and points that tend to scatter rather than to localise the treatment of the subject—to engender personal feelings and uncalculated opinions, than to bring a variety of facts into one comprehensive view of the subject. As I stated in my letter of the 28th ult., my chief object was to elicit well-ascertained facts in the case, and in order to do this we must treat the question in a liberal and scientific spirit, and thus elevate the enquiry to a standard far above mere quibbling to that of a rational investigation of the subject.

For my part in the matter, I cannot see any statement in my letter of Sept. 14 to justify Mr. Williams in saying that I "pounced" upon him. No such idea ever entered my brain, nor had I any intention of snuffing him out as a pretender; nor yet can I be responsible for any misapprehension on his part that may have arisen from any feeling of morbid self-complacency, but shall leave him to "dicker in the socket of his own presumption" till he "sickers" it out of his head.

I am anxious to learn all I can, and am always open to conviction from whatever source, and, even though Mr. Williams does not "set himself up as an instructor," yet I will attend to his instructions, and see what they lead to. First, he says I "charge him with inferring that the matter which constitutes the lode must have been, or still is, of the same nature as the bounding strata"—this is a misquotation, and should have been "the constitution of the lode is derived from the bounding strata." Now, the fact that the strata must have been formed prior to any fracture or fissure having been made, it follows that the substance constituting the lode must have been derived from without, and not from within, the strata, in relation to such fracture or fissures, as I understand Mr. Williams to imply, nor can I possibly conceive how any such hypothesis can be supported by fact, because what I have seen and experienced in the formation of lodes has been that of mineral solutions from without the fracture of the strata, and not from within, the strata itself containing such lode. Lodes are always composed of substances in a state of chemical combination, and, although there are besides these other substances at times in a state of mechanical mixture, yet no metallic deposit is found (that I am aware of) as a mechanical mixture; how, therefore, I ask, upon the hypothesis "that the substance constituting the lode is derived from the bounding strata," can such a chemical change be effected, or by what law can the metallic elements forsake their unconscious position in the strata, and go and nestle in "bunches," and "runs," and "ribs" in the lode, or "flat," or "string," or "pocket"? Such a view of the case seems to me absurd in the extreme, and yet nearly every miner that I have come in contact with believes it. Before going further with my argument, let me examine the instructions given me by Mr. Williams as to "the principal elementary substances entering into the crystalline rocks." He supposes that I am aware that *silica* is one; it so happens that I am aware of its being two elements, silicon and oxygen (SiO_2); also alumina being Al_2O_3 ; magnesia, MgO ; potash, K_2O ; soda, Na_2O ; lime, CaO ; iron, FeO (ferrous oxide, I suppose); manganese, MnO (manganous oxide); fluorine (?) and boracic acids (I suppose hydrofluoric acid), HF and BHO_3 ; oxygen and hydrogen; combined O_2H_2 water; carbonic acid, CO_2 ; sulphuric acid, SO_4H_2 ; muriatic acid (hydrochloric acid), HCl ; nitric acid, NO_3H . Now, Mr. Williams, I have disputed your so-called "elementary substances," am I right or wrong? Upon the same principle of chemical combination I dispute the rest of your catalogue; and why, I would enquire, have you omitted lead, copper, zinc, &c., for upon this omission I might point out a vein of lead, of copper, &c., filling up the walls of the vein, and yet not a single atom removed from the enclosing strata. If Mr. Williams will have the kindness to refer to my letter of the 14th ult. he will find that he misapprehends my meaning. I said, in respect of the lode deriving its elements from the bounding strata that "if this were the case it would be impossible to find in a lode any element not found in the strata in which it existed, yet in point of fact lodes or veins, as a rule, are entirely different in their chemical elements and constitution to that of the strata by which they are bounded." It is obvious I spoke of a plurality of lodes, and had especial reference to their metallic deposits, and I maintain that lodes are as different from the strata as are the various minerals and metallic oxides and sulphides from one another in their chemical elements and constitution—yet I do not say that all elements constituting the lode are not to be found in the strata. My view of the case is not that of position, but that relating to causation, and what I have seen going on

in the fissures of the rock lead me to suppose that the so-called metals are not elements, but compounds, even though our present mode of analysis does not enable us to reduce them to their lowest denomination of substance. I am fully aware of the general idea of miners as to "bearing strata," yet if they would divest themselves of all preconceived opinions they would find that deposits of ore found in the so-called "unproductive" strata are due to the same cause of mineralisation, and regulated by the same law of chemical composition in general, and altered by corresponding varying conditions apart from the strata in which it is found, as deposits formed in the so-called "bearing strata."

In speaking of the decay of copper, Mr. Williams, on referring to his letter of the 7th ult., cannot deny that he had reference to yellow copper, and in that instance arsenic did not enter into its composition—he did not then mention arseniuretted copper. Of course, although everyone knows how readily copper ores decompose under the action of acidulated water, but I cannot see any parallel between minerals and vegetable or animal substances. Minerals grow by juxtaposition, and organic substances by intussusception—hence the impropriety of the comparison between the decay of mineral and vegetable substances. I must now conclude, as I fear I am taking up considerable space, yet I must express my hope that someone will be able to tell us the composition of the strata enclosing some particular lode of copper, iron, or lead.

MINING ENGINEER.

Oct. 30.

DRILLING MACHINERY—THE BORING-MACHINE.

SIR.—Regarding the introduction of Drilling Machinery into mines as a very important subject, and as I happen to be familiar with the results obtained from the working of the Burleigh Drill, on Lake Superior—where, by the way, it is by no means common—perhaps you will allow me space for the accompanying remarks.

Doering's Machine was tried in Tincroft and in Dolcoath Mines, Cornwall, and thrown out, I believe, because it would not pay. I was never fortunate enough to learn the results obtained from working it; but it seems to me that somebody ought to have been sufficiently interested in this machine to find out what work it did, as well as what work it could do, and make it public. I saw a statement made that the machine drilled a given number of feet more in a month than six good miners could do; but, as its use has been discontinued, I infer that it cost more to break the ground than by hand labour. I was underground in this country with Mr. Nobel, when he was making efforts to introduce Nitro-Glycerine; he, of course, was praising the compound, and remarking on the success attending his endeavours to get it into use; "but," said he, "I could not succeed in Cornwall—they are prejudiced there against everything new." I felt my "Cornish" get-up, at the time, and was inclined to dispute the assertion made, but, on reflection, it seems to me that there is a deal of truth in what was said. I believe the putting in of the machine at Tresavean Mine was due as much to the efforts of the Polytechnic Society as to those running the mine. One of the deepest and best managed mines in the Camborne district was a long time seeing the propriety of using skips, and how many now stick to the kibble? Ten years ago the wheelbarrow was as common as the tram-wagon. I have yet to learn that it is gone out of fashion. It is only of late that any attention has been given to increasing the stamping duty in mines; and when Messrs. Harvey and Co. set up and tried the pneumatic stamps, in their very laudable efforts to reduce the cost of stamping, if I remember aright the tenor of the remarks made by the "astute" manager of a very rich tin mine was to the effect that "we will let somebody else try them, and in that way learn if they are a success."

There is a difference in starting a drilling machine in a mine, with the authorities interested in, or indifferent to, its success, the men commonly regard an innovation with disfavour; and I would defy any inventor to succeed in working a machine by Cornish miners if they considered it was against their interest that it should succeed, unless he personally supervised it, or had a competent person in his interest to do so. Cornishmen are good miners, and good mine managers—they ought to be—but they are just as apt as others to conclude that what they do not know is not worth knowing.

I am not going to draw the inference from the foregoing that the Doering Machine did not get a fair show, nor would I for a moment suppose that the authorities in the mines where it was tried had prejudged it; even if they had, they would exert no undue influence against it. Still, if they were not in favour of it, I would certainly venture the opinion that the Doering machine did not do its very best. I am ready, however, to drop the "Doering" as a failure, and will try to tell you what I know of the Burleigh Drill.

The first machine of the kind brought into the copper region of Lake Superior was tried at the Pewabic five years ago. The Red Jacket Mine used one for a short time just afterwards in sinking a perpendicular shaft from surface. The motive power applied was steam in both instances. I cannot conceive that a hot drilling machine could be a success. The next trial—and the first with air compressors—was made at the Aatec Mine, Ontonagon county; this was a disgraceful failure.

The Central Mining Company next procured a "Burleigh," about two years ago, to work in an incline shaft which they have been sinking for several years. The said shaft is being sunk in the country 14 by 8 ft., at an angle of 30° from horizontal; this machine is still at work. In last year's report of the mine the mining captain stated that by the use of the drill they had increased the rate of sinking 50 per cent. This was the first machine of the kind I saw at work; and it very forcibly struck me that the machine could drill more ground in an hour than three of the best miners could in a day. After that at the Central Mine had been working some months the Copper Falls Company decided on trying one on what they term the Ashbed—a lode of amygdaloidal character, varying in width from 7 to 10 ft., and dipping at an angle of 26° from horizontal. The lode is known here as a "stamp lode," the proportion of copper contained therein is about 1 per cent. of mineral, or 85-100 per cent. of ingot copper. The copper varies in size from the finest particles to pieces of 1 lb. weight, rarely larger. The lode forms an integral part of the formation, the over and underlying belts of trap protrude irregularly into it, consequently there is no regular or defined foot or hanging wall. Another feature is the almost entire absence of "slips," or "breast-heads." The ground cannot be called hard, but is "short" to "break," requiring more than ordinary care in planning holes. Four good men can drive from 18 to 23 ft. per month in an ordinary sized level; the same number can stoop from 10 to 12 fms. in the same time. For the past two years, instead of setting to the miner at per fathom to stoop, he has been paid so much per foot to drill holes, under the direction of a competent person. A more trying place for a drilling machine cannot be found, the inclination of the lode being a serious disadvantage in carrying a wide breast on a level. After getting fairly underway, it was found that three men and one boy in a shift, or six men and two boys with the machine, could drill from 40 to 44 ft. per month, carrying a breast 18 by 8 ft.; this was doing the work of 16 men, but at no reduction of cost. It was then decided to try what could be effected by stopping; and after a carriage was constructed for the purpose work was commenced; the carriage and machine weighs about 1½ ton. To move them up over the foot-wall a pair of common blocks and a small crab-winch are used. The mode of working is to set the carriage in the level, and commence cutting in for a stoop, which is carried towards the bottom of the level over the stoop worked out, lower the carriage down, and commence another. In working this way less drilling is performed with the machine, because more time is occupied in moving it; but it pays best. Early this summer three drills were started, two No. 1 compressors supplying motive power; these last cannot be relied on to do good duty without hindrances; very commonly the pressure of air being insufficient to work with. To obviate this, a No. 3 compressor has been set up, and was started two weeks ago. This gives ample air to run three, or even four, drills, going from 60 to 70 revolutions per minute. The gauge shows a pressure of from 45 to 55 lbs. per inch, varying, of course, with the number of drills running at the time. Since starting this an increase of duty has been effected, as well as a material saving in fuel.

I have been fortunate enough to obtain the results of last month's running with the three drills now in use; these figures may be taken

as the result of running three machines, with two No. 1 compressors supplying air:—

No. of Machine.	No. of Party.	Shifts worked.	Days worked.	Holes drilled each shift.	Holes drilled each machine.	Number of feet drilled each shift.	Number of feet drilled each machine.	Holes per shift.	Holes per day.	Feet per shift.	Feet per machine per day.
1	1	21	—	186	—	882.2	—	8.85	—	46.76	—
2	4	21	—	188	374	961.1	1943.3	9.0	17.85	45.76	92.62
3	2	21.5	—	175	—	905.9	—	8.18	—	42.13	—
4	5	23	22.25	184	369	936.8	1872.7	8.0	16.13	40.73	82.56
5	3	21	—	180	—	868.8	—	8.57	—	41.28	—
6	2	21	—	183	366	843.1	1711.1	8.71	17.28	40.14	81.42

No. 1 machine is the improved tunnel drill; No. 2 the small machine, as constructed five years ago; No. 3 is same as No. 1, but was worked irregularly, frequent stoppages being necessary to blast. The timing an average day's work with No. 1 machine before and after starting the new compressor gave the following figures (time is given in minutes). Men leave the "dry" at seven o'clock; quit work at six o'clock:—

	Two No. 1 compressors working.	No. 3 compressor working.
Men going to and returning from work	15	30
Moving carriage	69	94
Shifting, elevating, and fastening machine	126	123
Cutting collars for holes	38	23
Changing drills, 14 and 11 times respectively	55	31
Dinner time	13	14
Blasting	85	67
Compressor idle	11	21
Drilling time	278	232
Number of holes drilled	10	11
Number of feet drilled	45.9	55
Fastest drilling rate per minute, in inches	2.24	3.88
Slowest drilling rate per minute, in inches	.94	1.54
Average drilling rate per minute, in inches	1.98	2.66

The diameter of holes vary from 2 in. to 2½ in., none less than 2 in. The heaviest day's work, or, rather, the heaviest shift's work, performed so far has been the drilling of 13 holes, or 64 feet of ground. Some shifts, when the machine is employed in drilling "dry holes" in the back, only about half that amount of work is performed. Copper commonly offers a serious impediment to the drill, but for this it would be easy to drill 60 ft. per shift on an average. In the day's work given above one hole required 67 minutes of drilling time to sink it 5½ ft. deep, when, but for the presence of copper, the same work could have been done in 22 minutes. The rock broken in the mine last month was at the 4th level, by hand-drilling exclusively, at the 5th level by Nos. 1 and 2 machines, at the 6th level by No. 3 machine and hand labour combined. The rock from each level is carefully reckoned—that from 4th level amounted to 1035 tons, from 5th level 1941 tons. This is sufficient to show comparisons regarding cost, which at 4th level was as follows:—

Drilling holes, 3035.7 feet, at 26 cents.	\$789.28
Man in charge	65.00 = \$854.28
Four engineers, with machines, at \$60	240.00
Four assistant miners, with machines, at \$35	140.00
Three boys, carrying water, tampering, &c., at \$21	63.00 = \$783.00
Supply—270 pounds candles, at 20 cents.	54.00
102 kgs powder, at \$4	408.00
4550 feet fuse, at \$10	45.50
2 powder cans	1.00 = 508.50
Fuel for compressors, 45 tons coal, at \$8.	360.00
Engineers for compressors, two at \$45.	90.00
Oil, &c. (say)	60.00
	\$500.00
Deduct one-third for 6th level machine	166.66 = 333.34

Cost of breaking 1035 tons of rock, at \$1.055 per ton \$1071.48

The cost of running Nos. 1 and 2 machines at 6th level was as follows:—

Four foremen, with machines, at \$65	\$260.00
Four engineers, with machines, at \$60	240.00
Four assistant miners, with machines, at \$35	140.00
Three boys, carrying water, tampering, &c., at \$21	63.00 = \$783.00
Supply—270 pounds candles, at 20 cents.	54.00
102 kgs powder, at \$4	408.00
4550 feet fuse, at \$10	45.50
2 powder cans	1.00 = 508.50
Fuel for compressors, 45 tons coal, at \$8.	360.00
Engineers for compressors, two at \$45.	90.00
Oil, &c. (say)	60.00
	\$500.00
Deduct one-third for 6th level machine	166.66 = 333.34

Cost of breaking 1940 tons of rock, at 83.7 cents. \$1624.84

There is nothing charged for repairs, which for the month were trifling, and could be covered for a cent. per ton. This answers the question whether the Burleigh Drill will pay or not; and I have no hesitation in saying that better figures than these can be attained. These two machines broke, with twelve men and three boys, as much rock as could be obtained from 30 good miners. Better work can be done in a shaft where the ground is moderately hard, because a great deal more working time can be got out of the machine. Very much depends on the facilities for handling the machine; and it will require thought, experience, and time to decide what appliances are best. The mechanic puts into the miner's hands a machine that will drill 2 in. or 3 in. holes in diameter, from 40 to 60 ft. in the shift, and he ought surely to have brains enough to handle that power to the best advantage; there surely can be no reason why a charge of powder in a machine-drilled hole cannot break the same amount of rock as if exploded in a hole drilled by hand labour. Going back to the time when the United Mines, Gwennap, were at work, I remember that over 100*l.* per fathom was paid to 16 men for cross-cutting towards the "Hot lode," when, but for the excessive heat, 10*l.* would have been a good price. What would have been the value of cold-compressed air and the Burleigh Drill there? How many deep and hot engine-shafts are now being sunk, where the rate of sinking is nearer 6 ft. than 12 ft. per month, and where the sinking could be doubled, or even quadrupled, by using a drilling machine?

I am not writing in the interest of the manufacturer—who, by the way, could improve the machines by putting in better material—but simply as one who firmly believes that machinery will, in less than ten years, very generally supersede hand labour in mines.

Keweenaw County, Michigan, Oct. 9.

MINER.

SCIENTIFIC MINING.

SIR.—In the Supplement to the Journal of Sept. 16 is a letter under the above heading. It is difficult to understand what it portends; it seems to me to aim at nothing more than a change of terms—the substitution of the term "science" for that of "skill" in its application to mining. But it should be borne in mind that the term skill, as exercised in discovering the direction in which a lode has been removed on its intersection by a cross-course, is founded on and derived from observation, instead of from any abstract or speculative principles of science. From observed facts analogical reasoning proceeds syllogistically. But, beyond the facts of observation in this department of mining, the peculiar premises, or premises necessary to a right conclusion, do not exist. The question arises, How is science to be defined, and what latitude is to be accorded to it as contradistinguished from art? Science means knowledge, but it means much more; it means method and principles in the derivation of that knowledge and truth.

Is it true that at the junction of lodes, and beyond, their greatest wealth or productiveness is found? I aver that this is sometimes the case and sometimes not, and that in either case it does not depend on the junction, but on other natural formations and conditions. I am of opinion that before this branch of mining can be designated a science principles must be laid down specifying conditions, and premises the results consonant with the operations of natural laws. If scientific principles were applicable to this part of mining, I should be able to say whilst sitting in the counting-house, by being informed at what angle an intersection had taken place, whether displacement of the vein had occurred or not; and, if it had, could determine in which direction and to what extent the separation had been effected. But until I can ascertain the peculiarities of a district I am unable to determine the fact, for the simple reason that the reverse of what is true of one district occurs at another. And if the difficulties which beset this part of mining cannot be determined by either the angles at which the intersection takes place, or the evidences of the lode's direction afforded by the cross-course itself in and about the point of intersection, I am sadly at a loss to understand by what arbitrary, extraneous method it can be determined. If Mr. Williams can enlighten us on this very important subject I for one shall feel under an obligation to him, and will cheerfully accord to him that meed of praise his discovery would so eminently merit. But if the science spoken of is nothing more than the observation of an angle at which

an intersection took place, followed by a note of the result beyond, then the observation made whilst passing the streets of a city or town for the first time, respecting the cross streets forming the squares or blocks on either side, is as much entitled to be dignified by the term science as the facts derivable from observation exercised in mining.

It is much to be regretted that the letter of Mr. Williams contains an implication, at least on lead mining; but one which, I think, cannot be sustained against mining generally as practised in Cornwall, and it must remain for the parties implicated to exonerate themselves from any share in the censure, unwittingly or otherwise, cast upon them. For my own part, I believe Mr. Williams's supposed discovery to comprise nothing more important than a local peculiarity, and which, perhaps, might have been known years and years ago to other individuals. I could name instances where some of the finest courses of copper ores in some of the best mines of Cornwall terminated at the point of junction; and one instance where a mass of comparatively solid copper ore, 10 feet in width, terminated at the point of junction with a feeder, so called, 4 inches in width, and that feeder itself a solid ore of copper. The lode to which this refers yielded immensely, and hundreds of thousands sterling has been paid from it in dividends.—*Nevada, Oct. 11.* A MINER.

GOLD MINING IN NEW ZEALAND.

SIR,—Having recently forwarded you a few remarks respecting gold mining here, I beg to give you some additional particulars, which may be of interest to many of your readers interested in New Zealand Gold Mining.

The Caledonian Gold Mine for the past half-year, Feb. 1 to July 31, 1871, has raised 7309 tons of quartz, keeping 76 heads of stamps at work, and yielding in bullion 154,828 ozs., averaging over 21 ozs. per ton of quartz, realising in net dividends the enormous amount of £11,840, or at the rate of 823,680s. per annum. During this short period a dividend of 144s. per share has been paid to the fortunate shareholders, being at the rate of 24s. per month payment per share—the selling price of these valuable shares being from 140s. to 150s. These magnificent results for six months ought to be sufficient to satisfy the most sanguine investors with reference to the future of this most wonderful mine. I believe from the enormous size of the lode, and the strong auriferous metallic combinations contained in it that it will be found to continue and produce rich runs of gold to almost unknown depths.

The Tooky and the Otago Mines, being the first properties on the run of this lode, will, no doubt, get this fine vein in their ground at an early date, works being carried on vigorously with that object. Ultimately the Imperial Crown and Albion Mines will have the lode in its underlie at a good depth, which may take some years to prove the question.

At Coromandel the celebrated Kapanga Mine was the most productive and developed in the district until operations were suspended to get powerful steam machinery. At present the Tokatea Mine is proving exceedingly rich. Within a few days this mining company had 114 tons of their quartz reduced at the works and fine plant belonging to the New Zealand Quartz Crushing and Gold Mining Company (Limited), which gave the magnificent yield of 2825 ozs. of bullion, or over 24 ozs. of gold per ton of quartz.

It is almost impossible to note such returns as the above without being impressed with the enormous chances and mining capabilities of this truly rich unknown district. JAMES THOMAS, M.E.

Coromandel Gold Fields, Auckland, New Zealand, Sept. 7.

AMERICAN MINES, AND ENGLISH CAPITAL.

SIR,—I will thank you to correct an error occurring in my letter under the above heading, published in the Supplement to the Journal of Sept. 16. In the first paragraph it reads—"There can be no doubt but that in a new country like America many valuable deposits of silver ores will be found, and considerable profits shown as the result of working them." It should have been rendered—"There can be no doubt that in a new country like America many valuable deposits of silver ores will be found at very shallow depths, and considerable profits shown as the result of working them," &c. It is material to correct such an error as this, even though some time must elapse before it can be done, as its obtaining currency would militate against the design of the letter, misrepresent the mining resources of Nevada, and mar the effect intended, for it is almost needless to say, after the above corrections, that its object was to guard, if possible, against the sensational class of mining enterprises. Nevada, Oct. 11. A MINE OWNER.

A REACTION, WHICH COULD ONLY CAUSE A PANIC.

SIR,—To much credit cannot be given to the praiseworthy endeavours of Mr. Henry Sewell to avoid "a reaction, which could only cause a panic" in Utah shares, and his generous, self-sacrificing spirit is evidenced from the fact that he publicly controverts some of his former statements respecting this property. Of course, "to avoid a reaction, which could only cause a panic" the obvious plan was to exhibit some inconsistent and contradictory statements, to raise doubts, and talk vaguely about the future. After telling us some time back that one furnace at Utah would yield an annual profit of 15,000s. or 20,000s. per annum, he now warns us that from that furnace, and another now about completed of double the capacity he shall have no faith in as to forthcoming dividends, but he graciously admits that the working of these two furnaces is undoubtedly a great step towards the foundation of future dividends. That is to say, the two furnaces yielding an annual profit of some 45,000s. to 60,000s. per annum constitute a step towards the foundation of future dividends. Certainly 60,000s. per annum clear profit upon a capital of 100,000s. is truly insignificant, and not worth mentioning. Nothing less than four furnaces and 400,000s. a year profit will avoid "a reaction, which could only cause a panic." Mr. Sewell has been eminently successful; he has warned off the reaction and its accompanying panic, and shares have only dropped from 17s. to 10s. Truly the shareholders should be most grateful to the self-sacrificing Mr. Henry Sewell, who has thus delivered them from a panic. But for his philanthropic exertions, at the expense of transparent inconsistency on his part, the shares might have gone down to 5s. or even 1s. There can be no doubt that Mr. Sewell is a most able and experienced mining engineer, able to report favourably on a mining property when it merits it, and plain dealing enough to own to a blunder when he makes one. He tried his best to keep up the price of Utah shares, but they would go down. Nobody wished them to do so. No one made bets as to how far falsehoods and misrepresentations could force down the price of these shares. There are no bears in the share market who wish to see these shares at a low price, and if there were, they are far too honourable to take advantage of a panic. Bears only buy shares when they have dropped naturally under the laws of gravitation. Some scoundrel might hint that Mr. Sewell's letter, and the heavy drop in Utah shares, were cause and effect, and that Mr. Sewell's eloquent zeal to prevent a reaction, which could only cause a panic, was a plan in favour of the bears. If such a mercenary lives who is capable of such a vile misrepresentation I can only say let him be kicked across the Atlantic and back again, if necessary, and if possible. Mr. Sewell is the good pilot who safely steers the good ship Utah. First, after careful examination he tells us that one small furnace will afford a net profit of 15,000s. to 20,000s. per annum, and anon he informs us that that there must be four furnaces, each twice as big as his small one, before he can have much faith in forthcoming dividends. Mr. Sewell is a man of large views, and profits of 20, or even of 50, per cent. upon capital are too insignificant to inspire confidence in his breast.—Oct. 30. ENDYMION.

THE EBERHARDT AND AURORA MINING COMPANY.

SIR,—The publication, in last week's Supplement, of the balance-sheet of the Eberhardt and Aurora Mining Company affords me a fitting opportunity for referring to my letter on this company, in the Mining Journal of Oct. 21. In that letter I estimated—on data furnished by Mr. Phillips's report—that the reserves of ore in the Eberhardt and Aurora Company's Ward Beecher and North Aurora Mines would yield a net profit of 438,000s. In arriving at this amount I estimated the cost of mining, hauling, and milling at \$20 per ton, intimating at the same time that I thought this would prove to be a high estimate. I now see, from the accounts, that the cost of mining and hauling is \$10 per ton, and that in a contract between this company and the South Aurora Mining Company the latter realised a net profit of 1922s. 12s. 11d. for stamping less than 1200 tons of ore with their 30-stamps mill. The contract price was \$15 per ton, showing that the actual cost of stamping was not more than \$7 per ton. The total cost to the Eberhardt and Aurora Company of mining, hauling, and milling with their 60-stamps mill may thus fairly be put at 12s. per ton. This will increase the estimated net profit on the reserves in the Ward Beecher and North Aurora Mines—discovered since the formation of the company—to \$11,000s., saying nothing of the reserves, upon which the company was formed. These figures show, moreover, that ores of the assay value of \$26 per ton can be worked at a good profit.

There appears, then, to be no doubt whatever but that the present reserves will give a net profit of 50 per cent. per annum on the entire capital of the company for five or six years to come, and there is every prospect of further valuable discoveries of ore being made; indeed, the manager, in his last published report, confidently states as his belief that the high character of the celebrated Eberhardt Mine will be sustained by further discoveries on working to a lower depth. This opinion appears to be well founded, for an announcement is made

in the Mining Journal of last week of a discovery of ore in this mine of the assay value of \$150 per ton. Those shareholders, therefore, who in a wild unreasoning panic sold their shares at the late absurdly low prices will have ample time for regret.

The actual producing capabilities of the company on low grade ores, as shown by two fair working months, give an annual net profit of about 140,000s., or 60 per cent. on the entire capital of the company. In the estimate for working capital it is clear now that little or no margin was allowed for possible contingencies involving additional expenditure. When it is considered, however, that a trifling matter upsets the most careful calculations, and also how strong a desire has been shown on the part of the directors to carry out all the operations of the company as economically as possible, there is no room for censure. The immunity they calculated on falls to the lot of few. Stupidity or neglect on the part of subordinates will frequently mar the most careful calculations. Had capital sufficient to provide against all possible contingencies been raised at once the dividends would have been permanently smaller than they need be now, as I propose showing hereafter. The straightforward manner with which all the operations of the company are carried out augurs well for the future. At a time when expenditure on capital has gone considerably beyond the original estimates the manager finds that rock in the Ward Beecher Mine has to be removed to within 7 feet of the surface, because it endangers the safety of his workmen. On examination he discovers that this rock, though of very low grade, will still pay for working, and accordingly stamps it, without reference to what effect the consequent reduction in the profits for that particular month might have on the price of the shares. A manager who studied the money market instead of the interests of his employers would have thrown this rock aside. It is quite evident, therefore, that no source of profit is neglected, and that the manager has the most perfect confidence in the great resource of this valuable property.

A paragraph in my letter of Oct. 21 contains a suggestion on the mode of raising additional capital. A printer's error makes my suggestion unintelligible. I wrote "10 per cent." debentures; the printer altered it to "2 per cent." debentures. My reasons are these—supposing 60,000s. additional share capital is raised, the dividends on this amount will, on the present showing (50 per cent. per annum), amount to 30,000s. per annum. Hence, if 10 per cent. debentures be issued a future gain of 24,000s. per annum will accrue to the company. In a little more than two years all the debentures might be paid off with the amount saved, leaving the entire capital of the company as it stands at the present moment. The extent of the present reserves, coupled with the valuable plant and machinery belonging to the company, would furnish ample security for thus raising the additional capital required—10 per cent. debentures issued at 98, and paid off at par by quarterly drawings. One other point I wish to mention—the shareholders, in a fit of generosity, determined at the last meeting to remunerate the directors at the rate of 5 per cent. on the net profits. The principle is a bad one, and may lead to discontent. The example of the St. John del Rey Mine, one of the most successful foreign mines ever brought out in this country, may well, in this respect, be adopted as a model. J. A. NOV. 1.

CULABA GOLD MINING COMPANY.

SIR,—Can any of your numerous readers furnish information as to the doings of the above company, which was formed some two or three years ago? There has been no general meeting, and no report for some considerable period. The last report, issued some months since, stated that a profit of 35s. had been made on the month's working. Since then silence, and the company "gives no sign." May I suggest, politely to the directors, through the medium of your valuable Journal, that the shareholders would occasionally like to know how the brilliant promises held out in their prospectus are being realised? L. L. D.

MINERAL DISCOVERIES IN THE CALLINGTON DISTRICT.

SIR,—The Callington district, in Cornwall, appears to a lover of practical mineralogy to be one of the most enterprising localities in that favoured county. I read an interesting article in the Mining Journal about three weeks ago, in which a sketch was given of the progress realised at Okel Tor Mine, as the nature of the minerals found there became better known. In former articles I read with equal interest of the discovery of tin in large quantities in New Great Consols, and of the larger quantities of rich silver ore discovered from time to time in various mines of this district. In speaking of Okel Tor you showed how the mundie was found, in the first place, to contain copper, and then how arsenic and tin were successively brought to light. I look upon the discovery of tin in the mundie of this part of Cornwall as one of the most important discoveries realised in modern English mining. It is due, I believe, to Mr. Henry L. Phillips and Capt. R. Pryor, of the New Great Consols Mine, two gentlemen of extensive experience in Cornish mining. This discovery was not made by chemical analysis, but by stamping and washing the ore after certain external indications had led these gentlemen to suspect the presence of tin. I understand that a specimen was formerly forwarded to a very eminent chemist, and that no tin was detected in it: the sample was looked upon as a copper ore, and the tinstone, not suspected, was not isolated from the gangue, and so it escaped observation, though it was present to the extent of 4 or 5 per cent. I have shown, in one of my previous letters in the Mining Journal, how tin ore can be easily put in evidence in these circumstances by persons little accustomed to analytical chemistry.

With regard to Okel Tor, where tin was also discovered in the same manner, I have to inform you that two other rather interesting discoveries have recently been made there. The first is that of a peculiar silver ore, the exact nature of which I am at present unable to determine, as the specimens I have seen of it were so intimately mixed with other minerals that no distinct characters could be obtained. I believe, however, that it is silver fahlerz. It assayed 16 to 18 ozs. in the coarse pieces, highly mixed with quartz and spathic iron, but it has not yet been worked upon, so that the true nature and extent of this ore have yet to be ascertained. The next discovery is that of a mineral which, I believe, has never before been met with in England, at least none of our English works mention it as having been seen in this country. I allude to Voltzite, an oxy-sulphide of zinc, discovered many years ago by a French mineralogist, M. Fournet, at Rosiers, near Pontgibaud, in the Puy de Dome. It was found coating other minerals in a vein. Some time afterwards it was discovered again at that celebrated mineral locality, Joachimstal, where it is associated with blende, galena, bismuth, and argente (a sulphide of silver containing 87 per cent. of metal). At Okel Tor it was at first thought to be some form of tin ore, and a specimen was sent to me for examination. Its specific gravity was 3.62; it had a dirty rose colour on the fresh fracture—in fact, it possessed all the external characters, and was found to have the composition of voltzite. The sample forwarded to me was in the shape of thin brittle crusts, easily soluble in acids, with evolution of sulphuretted hydrogen. It is, no doubt, derived from blende. It is known to Cornish miners that a lode containing blende (or black jack as it is sometimes termed) is generally of a rich quality, and the discoverers of voltzite say that it usually accompanies silver ores, bismuth, and galena. The lode in which this interesting mineral has been discovered will therefore, no doubt, undergo a thorough investigation.

Allow me to state, in conclusion, that I have no interest in any of the mines mentioned in this letter, but having been frequently engaged by the proprietors of Okel Tor to report on their ores, I requested them, on reading your article, to allow me to mention these facts, thinking that they might interest many of your Cornish readers, whilst serving to point out the importance of examining any new minerals that present themselves unexpectedly in working mines.

Analytical Laboratory, Putney. T. L. PHIPSON, Ph.D., F.C.S. Formerly of Brussels University.

MINING IN CARDIGANSHIRE.

SIR,—It gives me great pleasure, on my again going through the upper district of Cardiganshire mines, to find, on the whole, an improvement. Plynlimmon, for the first, never looked more promising than at present, and by-and-by will stand high amongst the dividend mines. Also its neighbour, South Plynlimmon, is decidedly on the eve of becoming a good investment, for as the shaft goes down, and the levels are driven into the hill west, something will surely turn up to encourage its proprietors to push on until they may share the produce of that rich district. Esgair Lile, the first mine in the Castell Vale, is promising to become better than it has ever been. I trust and believe its promises may be shortly verified. And this brings us on to the West Esgair Lile, whose towering buildings, water-wheels, bobs, rods, launders, &c., plainly shows to the passer-by that something is to be found, and in still greater abundance as depth and length of levels are reached. Everything in the last week has gone to work upon the finishing stroke of the pitmen and their hard-working, persevering comrades, both under and above ground, for in this mine is to be seen one of the finest portions of the Van lode as has been seen since the noble Van came into existence. They have now resumed the sinking of Hamilton's engine-shaft on the course of this champion lode, and time alone will reveal what is to be found in this corner of the mining vineyard. Elisa's Corner, on our way, is to be seen bringing to light some of the hidden treasures of the Ponteryd range of mines; and looking at the depth at which the only about 2 fms. from surface, where lead began to form itself in a body of precious metal, I think it a district deserving immediate attention by all who may feel disposed to seek their fortune in mining, for (may it be said) there are many who will go into mining, &c. in parts of the world where they can never expect to visit themselves, and leave our own rich and cheap-working lead mines to rest in the hands of a few of the nearest, and I may say boldest, of miners, while the mines for years are probably not in the position of coming into the market; thus it is that so many of the mines of the Principality have been neglected, and so little known.

Now, the Ponteryd range of mines embrace some of the first in the county; and

for instance, here is to be found the old Bog Mines, for a number of years worked by Messrs. Taylor and Sons, afterwards by Mr. La Merit privately, and now by an influential party in the Midland Counties, whose names I may not as yet be allowed to mention in your interesting and world-wide spreading Journal, but who, nevertheless, have told me that they intend to work it so far as it is possible to do, and to plainly show the folly of working mines to a depth of 40 fms. or so, and then giving them the unfortunate name of a poor spent-out mine. I will say, without fear of contradiction, that this property, properly worked, will prove a very productive mine. I do hope it may soon be worked as it should, and it then will plainly show the way in which most of our Welsh mines have been treated in their youth, and what they are to-day.

In the same neighbourhood may be found the Clara, Llwynog, Powell, Cwm Brynno, and Bwadrain, all of which are good mines, and most of them showing their assistance in the Old Bog, by way of conducting their lodes in this valuable undertaking. Again, immediately to the south of those mines is to be found the Nanteos Consols, now being worked (with about 30 men on surface and underground), by a party of spirited English gentlemen. There are several strong ones opening out in the Valley up the Rhedol—the Nant-y-Moeb, Dinas, west of Elisa's Corner lode, and many others—but of the mines I have mentioned within the range of Ponteryd, both east and west, north, and south, scarcely any of them can possibly fail becoming profitable. Finding that mining is again upon the upward move, I hope that all would-be speculators will try their own at home, where they can for a small trifle come and see, before spending their money.—Aberystwith. S. TREVETHAN, Mining and Consulting Engineer.

ORENVER AND WHEEL ABRAHAM.

SIR,—Your long-established and useful Journal offering the best means of communication between unskilled investors on the one hand and skilful miners on the other, I am induced, as one of the former, to enquire of whomsoever it may concern what are the present prospects of this mine. I was induced to invest largely (and still hold) on the representations of the prospectus, which stated that the property was "promising again to become the richest mining property in Cornwall," and that "the profits of this renewed enterprise are likely to exceed even the extraordinary gains which rewarded the first proprietors," and that "under the care of this company it will become the most productive tin mine." What has become of the rich tin lode, 7 ft. wide, which appears in the map exhibited to applicants for shares, and in the early statements of the promoters? Now, what are the realised and ascertained facts? I pause for a reply. SHAREHOLDERS.

THE OXYHYDRIC GAS-LIGHT AT THE CRYSTAL PALACE.

SIR,—On the evenings of Oct. 25 and 26 a display of the oxyhydric gas-light was made at the Crystal Palace on a small scale, but sufficient to eclipse all the surrounding ordinary gas-lights. In part the yellowness and general indifference of the coal gas illumination no doubt arises from careless and adulterated gas manufacture, as when the gas is allowed to pass from the retort direct, or nearly so, to the gasometer, or, as is too commonly practised, when the adulteration by admitting atmospheric air to mix with the gas is carried on to too great an extent. Unquestionably, the so-called oxyhydric light quite casts into the shade all the best coal gas-lights in the Crystal Palace, which look yellow, dull, and dismal in the extreme in contrast with the diamond-like brilliancy of the new light, which will, besides this advantage in brilliancy, save a consumption in coal gas of 50 per cent.

At the Crystal Palace the gas-burner has a centre aperture for the coal gas to escape from, and this is in the centre of a circle of small perforations, from which a constant flow of pure oxygen gas is kept up, so as to impinge on the gas-flame, thereby causing its more complete combustion of the carbon of the coal gas (carburetted hydrogen). This arrangement necessarily demands a double manufacture, double gasometers, and double mains and gas-pipes. I do not, therefore, see how the new light is to come into immediate operation for the use of gas companies, unless they undertake to set up separate distillatory apparatus at each public building they might engage to supply. This method would seem to involve so much trouble and expense that we fear the promised saving in consumption of ordinary gas for mills, workshops, theatres, and public buildings generally would be less than would be requisite for such additional retorts, gasometers, manganese, labour, &c. Besides, any such necessity would deprive a large proportion of the public of all advantages, owing to their consumption being too limited to meet the requisite preliminaries for the manufacture and supply of the oxygen gas. And another difficulty might arise from the too probable increase in the price of manganese.

It will surprise no one acquainted with the chemistry of the subject that the oxyhydric gas should be so clear and brilliant as it appears in the experiments which are continued and likely to be extended at the Crystal Palace for the purpose of illumination; but practical men, taking a business view of the matter, will naturally enquire how is this scheme to be carried out on a large scale, and however can it be made to remunerate its promoters? Charing Cross, Oct. 27. A GAS CONSUMER.

[For remainder of Original Correspondence see to-day's Journal.]

COAL AND IRON IN VIRGINIA, U.S.

The certain and speedy completion of the Chesapeake and Ohio Railroad, connecting by rail every important city of old Virginia, through the heart of West Virginia, with the valleys of the Kanawha, Ohio, and Mississippi, gives a new value to the mineral wealth of both the States traversed by that great work. We are indebted to General J. D. Imboden for a full, circumstantial account of the iron and coal deposits of either State, with approximate statements of their extent and value respectively, which we condense as follows:—

The ascertained and tested coal fields of Virginia proper are—1. The Chesterfield, near tide-water at Richmond, 150 square miles.—2. The Prince Edward, 65 miles south-westward of the foregoing, 20 square miles.—3. The Carolina (in North Carolina), near Danville, 20 or 30 square miles.—4. The Cumberland (of Maryland), whereof there is in Virginia some 60 to 80 square miles.—5. The "Dora" (anthracite), in Augusta county, at the head of the Shenandoah, scarcely opened, extent unknown.—6. The New River and Catawba (Montgomery and Palaski counties, extending also through Giles county), partially anthracite, and developed in several places. This field extends into—

West Virginia, which embraces 16,000 of the 55,000 square miles of the great Allegheny coal basin—the largest, and among the richest known to exist in the world. Its centre seems to be the valley of the Great Kanawha, the chief river of West Virginia, wherein Prof. Ansted reports nearly 20 workable seams of coal, with an aggregate thickness of over 70 feet. Its entire length is 60 miles, extending from Northern Pennsylvania to Alabama, with a width ranging from 30 to 180 miles. Its horizontal position, proximity to the surface, and freedom from noxious gases, render it the easiest mined coal in America. From this field the coal is now dug which supplies New York and Philadelphia with gas. It has been computed that most of this area will yield 45,000 tons of coal to the acre, or 23,000 tons to the square mile; much of it so disposed as to render pumping or lifting unnecessary. Immense quantities of it are now boated down the Kanawha and Ohio, finding markets all the way down to New Orleans. Splint, Cannel, and every other variety of bituminous coal are found in different parts of this vast field. The splint is widely regarded as the best coal known for smelting iron from the ore, which exists in great abundance all through both Virginias. It is probable that the valley of the Kanawha, when traversed by the Chesapeake and Ohio Railroad and its branches, will be found one of our best localities for making good pig-iron cheap; while the Cannel coal yields 60 gallons of superior petroleum to the ton, and has been, as it probably will again be, the surest and most profitable source of that valuable oil (20 tons to the acre, containing 1,360,000 gallons of crude oil, which can be refined into kerosene or lamp oil). And fit timber for all casks is nowhere else so abundant as in West Virginia.

Iron ore is found in most of the counties of the two Virginias, and has been mined to profit in at least 20 of them. The magnetic ore which is found along the eastern base of the Blue Ridge, from Albemarle county down into North Carolina, is very rich and abundant: the James River Canal and most of the Virginia railroads (aid with British rails) traverse across it, as the Chesapeake and Ohio either does or soon will. The Norfolk and Great Western Railroads soon to be pushed through the southern part of Patrick county. The charcoal pig made from this ore is hardly surpassed. Massive beds of brown hematite exist in Carroll county, not yet available, but soon to be made so by the railroad just named. No richer ore is anywhere found. Red and brown oxides underlie the soil of nearly every county in Western (Old) Virginia, from Botetourt to Grayson, and Tazewell, as brown hematites do those of the entire Shenandoah Valley, and either have been or soon will be made available by the completion of the railroads required to combine them cheaply with coal. When the Chesapeake and Ohio and Norfolk and Great Western railroads shall have been finished, the requisite branches and connections will almost build themselves. When these roads shall have commenced freightage ore to the coal fields and coal back to the ore beds, Virginia may profitably supply half the seaboard and a third of the Ohio Valley with cheap and excellent iron. The fact that the Chesapeake and Ohio Railroad had to be cut, for a considerable distance, through a vein of coal 11 feet thick, will serve to convey some idea of the mineral wealth of the two Virginias. New railroad from the Chesapeake and Ohio, at the junction of the valley of New River, forming the Great Kanawha, will run up the valley of New River, crossing the Virginia and Tennessee valleys, and the Norfolk and Great Western Roads, carrying the coal of the Kanawha Valley to the great beds of Southern Western (Old) Virginia, and incite unwonted and beneficent activity in iron-making throughout.

In most counties of either Virginia excellent coal or ore (often both in close proximity) can now be bought at prices ranging from \$5 to \$50 per acre. Many of these areas have a rich, deep, virgin soil, with a splendid growth of forest trees covering two-thirds to three-fourths of them—lands which in Pennsylvania would be deemed dirt-cheap at \$1000 per acre. We can doubt that free labour with railroads will soon give a like value to the mineral lands of Old and New Virginia? [We have extracted this important article from the New York Daily Tribune.]

Oct. 31. Further information on the subject can be obtained of Mr. H. H. Rees, at the Virginian Land Company, 100, Palmerston-buildings, City.]

Meetings of Public Companies.

CALEDONIAN GOLD MINING COMPANY, NEW ZEALAND.

At the second annual meeting of shareholders, held at Auckland, the directors presented a report of the company's operations for the year ending July 31:—

For upwards of two years past the shareholders have patiently waited the completion of the main shaft, necessary to prove the value of the reef in their ground. Great difficulties hindered the operations; the hardness of the stone to be penetrated, the fault at the reef, and the heavy influx of water, were difficulties successively overcome, but only by great perseverance, and after considerable outlay of capital. About the latter end of 1870 arrangements were made for exploring the upper portion of the company's mine by driving from the Golden Crown main level along the line of reef. This exploration did not yield any very large results. The crushing from the reef during the first six months of the year, or up to Jan. 31, 1871, yielded 2892 ozs. from 919 tons, or over 2 ozs. to the ton; but about the beginning of February last the main reef of gold was met with, and from Feb. 1, 1871, to July 31 of the same year the results were such as to satisfy the most sanguine. The output of gold for that time was 154,828 ozs., which realised net for distribution among the shareholders £1,840, or at the rate of 833.680l. per annum. The quantity of stone crushed during the last half-year for this yield was 7309 tons, producing over 21 ozs. to the ton. The total number of tons crushed for the whole year has been 8238, producing 157,220 ozs. of gold; the average yield has been over 19 ozs. to the ton. This gold realised 445,959l. 11s. 11d., of which the sum of 413,270l. has been paid to the shareholders in dividends, making a payment to them of 144l. 10s. per share for the year; but of this amount the large sum of 144l. per share has been paid for the last half-year, or at the rate of 24l. per month on each share. The directors believe such results have never before been realised in the history of gold mining.

The directors look forward to the future with great confidence. The mine manager's report will give a description of the works in hand and those projected in the mine. A perusal of this report will show the exceedingly valuable property possessed by the shareholders.

The directors have hitherto been able to meet the shareholders with a fortnightly dividend of a monthly dividend, and they do not at present see any reason why the payment of a fortnightly dividend should not continue; but they would remind shareholders that the falling off in the amount of a fortnightly dividend is no rule by which to estimate the value of the mine.

Hitherto the directors have devoted their time to the company's service, and borne no small amount of responsibility cheerfully without remuneration; but the directors feel that the shareholders cannot require this at their hands any longer, and that provision should be made for the payment of a reasonable remuneration to the directors for the time being. They propose a vote at the rate of 500l. per annum for division among the board, commencing from Jan. 1, 1871, up to the next yearly meeting.

C. J. STONE, Chairman.

Dividends Paid for the Year ended July 31, 1871:—

Dec. 8, 1870	£ 0 10 0	per share	£ 1,450 0 0
Feb. 6, 1871	2 0 0	"	5,720 0 0
" 15, "	5 0 0	"	14,300 0 0
" 24, "	6 0 0	"	17,100 0 0
March 7, "	12 0 0	"	28,600 0 0
" 21, "	12 0 0	"	34,320 0 0
April 4, "	12 0 0	"	34,320 0 0
" 18, "	12 0 0	"	34,320 0 0
May 2, "	14 0 0	"	40,400 0 0
" 16, "	10 0 0	"	28,600 0 0
" 31, "	25 0 0	"	71,500 0 0
June 13, "	12 0 0	"	34,320 0 0
" 28, "	15 0 0	"	42,900 0 0
July 14, "	6 0 0	"	17,100 0 0
" 28, "	3 0 0	"	8,580 0 0
Total	£14 10 0	0	£413,270 0 0

THE POLBREEN MINING COMPANY.

The third general meeting, for the present year, of the shareholders in the Polbreen Mine, was held at the account-house, on the mine, in St. Agnes, Cornwall, on Friday, Oct. 27,

Mr. Y. CHRISTIAN in the chair.

The usual formal business having been transacted, the statement of accounts, embracing the mining operations and tin obtained during the four months ending Aug. 21, was submitted. The expenditure on labour and materials for the four months had been 1810l. 10s. 11d., and the lords' dues amounted to 52l. 11s. 5d. Two sales of tin were carried to credit, the weight being 12 tons 14 cwt. 3 qrs. 24 lbs., and the sum realised 1051l. 8s. 6d., or an average of 82l. 10s. per ton. Altogether, the debit balance against the mine stands at 1445l. 9s. 4d.

The following report was presented by Capt. John Nancarrow, the manager and mining engineer:—

Since the last general meeting, on July 7, we have added considerably to our dressing-floors, constructed a long strip and trunk for the "roughs," erected 11 frames, with launders, covers, slime-pits, &c., built a great deal of masonry at the floors, and are now erecting a sampling-house. Underground, we have continued to drive east on Dorcas lode, proceeded with the rising on south lode, and have cleared a cross-cut towards it at the 32 fms. level; pushed forward the rising east and west on Tregoy's lode, and have driven a cross-cut at the 22 fms. level 10 fms. north towards the flat lode. Various other small operations, clearings, &c., have been accomplished.—South Lode: The rise above the 22 fms. level is worth 8l. per fathom, and the ground standing to the west will work on tribute. The 32 fms. level cross-cut south has been cleared, is now being driven towards this lode, and will soon reach it, when we shall rise towards the 22 fms. level, and sink from that level also, for the purpose of laying open the lode and ventilating both levels. This is a very important part of the mine, and is likely to yield a great deal of tin.—Dorcas Lode: The 12 east has been driven through a lode that will work on tribute, and the ground is more favourable for progress. The tribute department on this lode is improved. Some pits are being worked at much lower tributes, and fresh ground is taken up, so that we have at Chow's, Christian's, and Thorpe's shafts, at the several levels, 33 pitches, worked by 36 men.—Tregoy's Lode: The 22, west of Christian's engine-shaft, has recently opened some good tribute ground; the lode in the end is composed chiefly of tin, mixed with tin. The 22, east of cross-course, is in a large, promising lode, strongly impregnated with copper, and yielding the stuff of moderate price. The back and bottom are working on tribute at 9s. 6d. in 11. The lode in the west has recently been discovered by a slide; the bottom is working at 8s. 11d. This lode is cut into near the cross-course 6 fms. below the 22, where it is worth 15l. per fathom. We have commenced driving towards it at the 32 fms. level, where we expect soon to get into a valuable lode.—Flat Lode: There are two fresh pitches started near the cross-course, that improve by working, and promise well. The eastern pitch near the end has greatly improved. Tregoy's lode here forms a junction with the Flat lode. The former is opened on for 6 fms. in length, and varies in value from 30l. to 60l. per fathom. Some of the tin is of the richest quality ever seen. We have commenced driving east from this point in a lode worth 30l. per fathom, and have a prospect of opening up very profitable ground.—General Review: There are now 20 pitches working by 68 men, at an average tribute of 19s. 6d. in 11; engaged in tinwork and filling; 21; at surface and in dressing, 47; total number of hands employed on the Polbreen Mine, 120. We sold for the last month 5 tons 17 cwt. 1 qr. 14 lbs. of tin, at the price of 84l. 10s. per ton, realising 495l. 18s. 2d., or upwards of 40l. over the cost-sheet. The quality of the Polbreen tin has always proved exceedingly good, and has now stood the test of five sales, the first having been made last month ago. The total value of the sales in that short period has been 2924l. 2s. 2d., the average price being full 80l. per ton. The new frames and other dressing apparatus work exceedingly well, and we have done in full course of dressing all tin. Above and below, the mine is now exhibiting an appearance of gratifying promise and completeness. In opening out underground there has been an amount of expenditure beyond what could have been at all foreseen; and so large have been our returns of ore that an outlay at surface, on the dressing-floors, and other appurtenances, earlier and greater than was expected, has been forced upon us. But this necessity is the best proof of the wealth of the mine. We have now, however, turned the scale to the profit side, and were all present claims on the mine would be at once settled by a dividend, and a monthly surplus for dividend, that would naturally increase as a more extended area of the mine is brought under operation.

The CHAIRMAN then said he thought the report that had just been read would amply console those present for what was always a disagreeable step at mining meetings, no less to the management than to the shareholders. He referred to the necessity the committee find themselves under of proposing that a call be made sufficient to realise Polbreen from every liability, save that of paying a dividend at the earliest possible moment. (Hear, hear.) On the last occasion of his having the honour to occupy the chair he had said, "It seemed to be clear that Polbreen would pay its first dividend within less than two years from the date when mining proper could be commenced." Now, mining proper did not commence at Polbreen till March, 1870, and he thought there was no reason to doubt that a first dividend would be declared in the March of 1872. It was perfectly within the power of the shareholders to place the mine in the dividend-paying list at that time, by allowing no impediment to step in and check the progress now making. The mine was now yielding profits—clear profits. The report showed that the value of the last month's tin exceeded the cost-sheet by 40l. It was inevitable that this should be the case, and that the shareholders, for their expenditure on the plant on the profit side should go on augmenting, for their cost-sheet mainly of "labour," while the item of "materials" would pass off on a diminishing scale. The "materials" actually paid for within the four months amounted to a sum of 650l., still leaving arrears that had now to be mainly met by the shareholders. He might state that it was not till very other plan had been thought of and mentally worked out that the committee could bring themselves to the determination of recommending a call. Borrowing money was at one time a good, and found themselves suffering under what was taken for a temporary exhaustion of capital. The practice, however, was found to be a temporary one, and shareholders, juggling them into a false security, that was too often followed by a hard and unrelenting reality. (Hear, hear.) Besides, some late decisions of the Stannaries Court had rendered the local capitalists not so ready to lend money for mining operations as they once were; for the Court was evidently bent on protecting the unconscious shareholder from an accumulation of debt. And if that course had been possible the real effect would have been to hamper

the development of the mine, now proceeding at a wonderfully prosperous rate, and to keep them with their heads just above water for an indefinite period when by striking out boldly the shore might be speedily reached, and safety and a golden prize secured at one and the same moment. The committee satisfied themselves that the Polbreen Mine, to use the words of the report, had "turned the scale to the profit side;" and once convinced of that, they felt it would be unjust to the shareholders, and weakness on their part, if they refused for an instant to take on themselves the responsibility of advising a call. What, in truth, was the present position of Polbreen? Nearly 3000l. worth of tin had been sold from the mine since March 29. On every occasion their tin had fetched the top price of the day. The price of tin was excellently remunerative in the present year, and was likely to continue so. (Hear, hear.) On the last account-day Polbreen had 14 pitches set, worked by 34 men, at an average tribute of 10s. in 11. It had now 20 pitches, worked by 52 men, at an average of 9s. 6d. in 11, leaving, therefore, more than half as profit to the adventurers. These facts would, he thought, be sufficient to convince the shareholders of the rapid strides Polbreen was making, and show them what folly it would be not to consent to an effort that would leave the mine untrammelled now that the road to dividend lay so clearly open. (Hear, hear.) He could not but call attention here to a report that would be circulated with the official one just presented by Capt. Nancarrow, which stated very forcibly the causes that up to this moment had impeded the advance of Polbreen to dividend. He would vouch for the peculiar qualifications for the task of the gentleman whose name was to that report, and it would be seen that while recognising their difficulties he admitted they had all been overcome by the praiseworthy energy and ability of their mining manager, and that he concluded with the assurance that they were in possession at last of a mine that was now permanently profitable. Gentlemen (concluded the Chairman), I heartily join in the praise so justly awarded to Capt. Nancarrow, and I unhesitatingly endorse the assertion that we are now, or at least have it in our power to be, in possession of a permanently profitable mine. The profit to the shareholders will commence the very moment our existing liabilities are wiped off. In amount they are but a mere fraction compared to the value of what the shareholders may see at this moment standing on the mine in the shape of ore, buildings, machinery, and a vast general plant. I trust that, when the resolution in favour of a call will pass without a dissentient voice, and I firmly believe that what with dividend and value added to shares the whole amount will be restored to the shareholders within a few months, with a certainty yet before them of larger dividends to come, and of shares still doubling in value. (Cheers.)

The report having been adopted, and the resolution carrying out the 15s. call recommended by the committee unanimously assented to, some questions were put by a SHAREHOLDER in reference to the point whether the call would completely relieve the mine from all liabilities to render the advent of a dividend undoubted? To this the CAPT. NANCARROW replied that the mine had been making a small profit for some time, and that were the liabilities discharged he entertained not a doubt about the possibility of declaring a very fair first dividend at the spring account-day of next year, and the dividend would, he was of opinion, be an increasing one. This announcement was received with satisfaction.

The committee having been re-elected, a vote of thanks to the Chairman closed the proceedings.

WEST POLBREEN MINING COMPANY.

A general meeting of shareholders was held at the account-house of the Polbreen Company, in St. Agnes, Cornwall, on Friday, Oct. 27, Mr. Y. CHRISTIAN in the chair.

The statement of accounts showed an expenditure on labour and materials for the four months ending August 31, of 290l. 8s. 7d., leaving a balance in favour of capital of 3670l. 4s. 4d.

The report presented by Capt. Nancarrow was then read, as follows:—

"Since the last general meeting, in July, our operations have been continued without intermission. These include drivings on three lodes, and the clearing and repairing of the adit eastward into Polbreen, so that there is now a thorough communication with the adit driven through that mine. This was not only necessary to be done before winter as a drain for the water, but has now been done much more expeditiously and with less expense than it could be done then.—South Lode: This lode yields tin, and promises to repay its labour during the coming winter. It is of the same character as the best tin-bearing lodes in the district at this depth, and may be expected to prove as great a prize here as it has in the adjoining Polbreen Mine. It is not easy to find a piece of mining ground better situated than West Polbreen, and it seems only a matter of time for development, since the great success attending the operations in Polbreen leaves no room to doubt of the outlay here being amply repaid."

The CHAIRMAN said he was sure the shareholders would consider the document just read as one presenting a picture of progress, mingled with the economy and caution that should characterise the attempts made at developing a set of the nature of West Polbreen. The first object to be attained was to provide proper means of egress and ingress. Their shafts and their adits were the first things to be seen to, and those attended to, mining could be commenced in earnest. Their expenditure had been moderate, as might have been expected from a working that for the present, and for some time to come, would dispense with the assistance of steam. Each of the three lodes now being operated on was yielding some tin, and giving promise of plenty more behind. The great matter for the West Polbreen shareholders was the wonderful quantity and quality of the ore now being produced from Polbreen, and the certainty that their tin was of the same character. Their manager had taken care, by clearing the adit into Polbreen, that West Polbreen should enter no competition with Polbreen in its labour during the coming winter. He had no doubt that their next account would bring them a report of great advances having been made. Their drivings were pushed on without intermission, and early next year they might rely on West Polbreen would begin to assume that work of bustle and activity that met the eye on the adjoining property. The price of tin was at a figure that greatly encouraged them in their exertions, and he was content with the conviction that their excellent mining manager would strain every nerve to bring some West Polbreen ore to the test of sale, because he knew that his opinion of it was, it would add another to the list of those St. Agnes mines that were maintaining the reputation of the district in such a splendid manner. He could earnestly recommend those present, and those whom his remarks would reach otherwise than by the voice, to increase the number of their shares in West Polbreen, before they went to a premium beyond the trifling one then ruling, for they might rely on it that, as anticipated from the first, West Polbreen would do what Polbreen had done, and with less expense, and in as short a time. On the next occasion of his meeting them he should be able, he thought, to tell them of an addition to the number of the lodes they were driving on, and of a considerable extension of the area of their tin-bearing lodes. He had no doubt that the capital of the mine would prove quite sufficient to carry West Polbreen into the dividend-paying list, and their shares to a value two or threefold greater than what they gave for them. (Hear, hear.)

The report having been adopted, the day's proceedings closed with the customary compliment to the Chairman.

PENHALLS MINING COMPANY.

A general meeting of shareholders was held at the offices of the company, Austinfriars, on Wednesday, Mr. E. KING in the chair.

Mr. JAMES HICKEY (the secretary) read the notice convening the meeting, and the minutes of the previous one, which were confirmed. The statement of accounts for the three months ending September was then submitted. The tin sold during the quarter realised 4699l. 15s. 3d., and there were other credits amounting to 24l. 18s. 6d., making 4644l. 13s. 9d. in all. Against this the total expenditure incurred was 3162l. 8s.; leaving a profit on the three months' working of 3481l. 5s. 9d. The balance from last account was 1268l. 5s. 6d.; = 2170l. 18s. 3d.; and, deducting therefrom 700l. for the August dividend, there remained an available balance of 1470l. 18s. 3d.

The CHAIRMAN remarked that the balance-sheet was particularly favourable. Owing to the increased price of tin they had obtained an increased profit, although they had sold 1½ ton of tin less; and, in addition to this, the meeting was called four days earlier—that was to say, there were four days less included in the account. Comparing their position at present with that at their last meeting, he found that their tinwork operations were about 40l. per fathom more than they were three months ago. This was particularly satisfactory, for the mine was an extremely difficult one to work, as they had as peculiar a piece of ground as could anywhere be found. They had five cross-courses, and almost innumerable gossans, so that they were constantly losing the lode. They had at the present time, owing to cross-courses and gossans, no less than 35 fms. of tin to be worked, and the average of the tin only equalled about 30 lbs. to the ton of stuff. With all this, however, they had been able to earn a profit of 90%, and he thought he might congratulate them that they might look forward to better results still.

The subjoined report of the agents was then read:—Oct. 30.—During the past quarter the rise in the back of the 80, north of engine-shaft, has been continued on the large gossan to the extent of 9½ fms., without as yet meeting with the lode. The 70 west, at the commencement of the quarter, was in good tin ground; latterly, however, it has been producing tinstuff, but of low quality. The slope above this level is worth 20l. per fathom. A slope in bottom of the 60 is worth 12l. per fathom. The 60, west end, is producing low-quality tinstuff, but not of much value. The 60 east is unproductive. The 54, west end, has been driven through 4 fms. of good tin ground, averaging 20l. per fathom, and at present is worth fully that amount. The 50, west of the great cross-course, contains a very large and promising lode, and so far as can be seen, is worth 10l. per fathom. In the 20, west of the engine-shaft, the lode has been opened out on the west side of the eastern cross-course, and found to be 3½ ft. wide, worth 12l. per fathom. The cross-cut is being continued south, to find its eastern part. A rise in the back of this level is worth 2l. per fathom, and a slope 8l. per fathom. The 44 east, on the Pink lode, is worth 6l. per fathom. A communication with this level from the 50 has been effected, and produced good ventilation through this part of the mine. At the Pink Mine the cross-cut north of the Shop shaft, in the 44, is being continued in search of the lode beyond the gossan met with in the bottom of that shaft, but as yet is not found. The 40 has been extended east so far as to intersect the gossan just referred to, and discontinued. The lode in this driving has averaged in value about 7l. per fathom. The 30, in the back of this level, is worth 2l. per fathom, and a small branch 3 to 4 in. wide, containing some good occasional stones of tin; this, however, is not the lode sought for. At the flat-rod shaft the 30 cross-cut north

is being urged on as fast as the nature of the ground admits, which is not so fast as formerly, owing to the ground being harder. The downright lode, cut through some few fathoms behind the end, is now being opened on, and east of the cross-cut it is worth 10l. per fathom, and west 6l. per fathom. At Sarah's the 17, west end, has changed but little in value for some time, the lode being from 3 to 4 ft. wide, worth 5l. per fathom. The slopes above this level are worth, respectively, 7l. and 8l. per fathom, and those above the 14, east of the shaft, 8l. and 9l. per fathom respectively. At West Pink the operations are, for the time, suspended, the water being too plentiful to continue those operations with any advantage, and the men are removed to the 40, west of the great cross-course, to intersect the lode just opposite the West Pink shaft, which will probably drain that part of the mine. During the ensuing quarter two of the pumping-engine boilers will have to be repaired, at a cost of 70l. to 80l. We have at present employed 65 tributaries and 165 tutwork men, 26 of the latter being employed entirely in cross-cutting various points. The tribute pitches are, on the average, not quite so productive as they have been, but the aggregate value of the tutwork points at present in operation is 153l. per fathom, against 115l. per fathom at your last meeting. This looks healthy, and we have full confidence in the mine long continuing to be a profitable one to the adventurers.—S. BENNETTS, W. HIGGINS.

The CHAIRMAN expressed his readiness to give any additional information that might be required. He might at the same time state that at the committee meeting, which was held before the general meeting, a minute had been entered to recommend a dividend of 3s. per share, which would leave a balance of 3s. per share to carry over. They hoped hereafter to increase that dividend, but even at present there was not much to complain of, as they had paid-up but 3l. per share, and 3s. upon that amount quarterly was equal to 30 per cent. per annum. They had already returned 2l. 2s. 6d. to the adventurers, with every prospect of continuous dividends. They had before them a splendid price for tin, and their costs were charged up as closely as any mine in Cornwall; everything was charged to the end of September, although they were holding their meeting on Nov. 1. In some of the cross-cuts he anticipated discoveries, but in ground like theirs it was difficult to express an opinion. Their mining captains displayed the greatest ability, and were certain to do their utmost for the welfare of the undertaking. The report and accounts were then unanimously adopted, and the dividend of 3s. per share agreed to.

The proceedings terminated with the usual complimentary vote to the Chairman.

[For remainder of Meetings see to-day's Journal.]

FOREIGN MINING AND METALLURGY.

The advices which come to hand as to the French iron trade are generally satisfactory. The markets appear to be animated at all points, as well in the north and in the east, as in the centre and in the south. The Paris market is also represented to be more active. In the Champagne group charcoal-made refining pig has made 4l. 16s. to 5l. per ton; mixed quality ditto, 4l. per ton; and charcoal-made ditto, 3l. 10s. per ton. Pig for re-casting has made 3l. 16s. to 4l. 4s. per ton, according to qualities or numbers. Rolled iron, from charcoal-made pig, has brought 9l. 4s. to 9l. 8s. per ton; mixed ditto, 8l. 16s. to 9l. per ton; coke-made ditto, 8l. to 8l. 8s. per ton, according to the importance of orders and according to the works. Machine No. 20, coke-made, has brought 9l. 12s. per ton; mixed ditto, 10l. 4s. to 10l. 12s. per ton; puddled charcoal-made, 11l. 12s. to 11l. 16s. per ton. In plates there has been by continuation a good current of orders at the old price of 10l. 16s. and even 11l. per ton. The foundries are in a good position. Orders reach them without interruption, and at better prices; some first-class houses are accepting an advance without dispute. From the Meurthe and the Moselle districts there is nothing very striking to report.

Coal has been tending upwards at Paris. The presidents and sundry delegates of the Chambers of Commerce of the northern departments have visited Paris, and have had an interview with Baron Alphonse de Rothschild, president, M. Delebecque, vice-president, and various other directors of the Northern of France Railway Company. The interview lasted three hours, and M. Mathias, general manager of the company, assisted at it. A great number of points in connection with the traffic were discussed, and the delegates are stated to have expressed complete satisfaction with the treatment they received, and the promises which were made to them. Extraordinary efforts are stated to have been made of late by the Northern of France Company to restore regularity in all its traffic arrangements; and in proportion as plant now in course of construction is delivered to the company it is expected that all grievances will be removed. The state of the traffic upon the Paris, Lyons, and Mediterranean system is not regarded as equally satisfactory. The creation of a school of mines is being attempted at Lille or Douai, in the centre of the coal basins of the department of the Nord. The prefect of the department of the Nord intends, it is said, to propose to the council general of the department to participate to some extent in the establishment of the school. In the Belgian coal trade a firm maintenance of prices, an abundance of orders, and an impossibility of keeping pace with them all, in consequence of the want of plant, are the current features of the moment. In spite of all drawbacks, however, the state of affairs continues favourable, since stocks are being reduced, while prices are maintained very firmly. Coke is also advancing. In the Mons basin some important contracts for unwashed coke have been concluded at 16s. and 16s. 10d. per ton, delivered on trucks. The exports of coal from Belgium in the first seven months of this year are shown by official tables to have amounted to 1,690,000 tons, as compared with 2,172,000 tons in the corresponding period of 1870. The exports to France have greatly decreased this year, while those to Germany and Holland have expanded.

The iron trade has not experienced much change in Belgium during the last few days. The upward tendency which prices have displayed has, however, made another step forward, the rate for merchants' iron having been carried to 7l. per ton by some works in the Charleroi basin. The greatest activity continues to prevail in all the ironworks of the group. A royal decree authorises sundry extensions in the Ougrée Works—four steam-engines, three steam pile hammers, three steam-pumps, &c. A strike among the working mechanics of Gaud has unfortunately not yet been adjusted. The transference of the establishments of MM. Dorlodot Frères to a joint-stock company is now an accomplished fact. The new company is composed of MM. Eugène de Dorlodot, Léon de Dorlodot, Edouard de Haussy, Vander Stichelen, formerly Minister of Public Works, and Charles Evrard, director of the Railway Plant Manufactory at Molenbeek-lez-Bruxelles. The establishments of MM. de Dorlodot comprise five blast-furnaces and a rolling-mill for merchants' iron at Acoz, besides another great rolling-mill for rails, &c., at Châteaufort. The La Croixère rolling-mill, belonging to the new company of Victor Pierard and Co., will be again brought into activity next month. In the Grand Duchy of Luxembourg, and in the part of the mineral basin yet remaining to France, mineral lands are being competed for with quite a feverish anxiety. A sale of 25 acres has just taken place, for instance, at Rodange, and the biddings were carried to 8000l. This eagerness to acquire lands in the districts in question is explained by the fact that the production of pig in the Luxembourg district next year is estimated by anticipation at the considerable total of 300,000 tons. Should this estimate be realised there will be an increase of about 158,000 tons on the production of the present year. This increase will be the result of the lighting of six new blast-furnaces, the daily production of which will be 440 tons. Official tables show that the exports of minerals and limailles from Belgium in July amounted to 23,108 tons, while rough pig and old iron was exported to the extent of 3290 tons, wire to the extent of 241 tons, rails to the extent of 11,693 tons, plates to the extent of 2617 tons, rolled iron to the extent of 2455 tons, anchors and chains to the extent of 5 tons, nails to the extent of 1196 tons, worked iron to the extent of 1084 tons, and castings to the extent of 307 tons, making an aggregate of 29,892 tons. In this total the Zollverein figured for 12,725 tons; Russia for 3640; the Low Countries for 3129; Turkey for 2473; France for 1726; and England for 1518 tons. The imports of July may be classified as follows:—Minerals and limailles, 59,594 tons; rough pig and old iron, 5584 tons; wire, 62 tons; rails, 56 tons; plates, 68 tons; other rolled iron, 324 tons; anchors and chains, 10 tons; nails, 12 tons; castings, 61 tons; and miscellaneous, 305 tons: making an aggregate of 6472 tons. The raw materials imported into Belgium in July exceeded the exports in the same period by 38,780 tons. The manufactured iron exported in July exceeded the imports by 23,420 tons. The steel imported into Belgium in July comprised 19 tons of cast-steel, 574 tons of steel in bars, &c., and 49 tons of worked steel. The quantity of steel exported only amounted to about 12 tons. Contracts for nine goods locomotives have been let in Belgium. The contracts were let in lots of three engines each. The first lot was obtained by the Tubize Works at 2314l. per engine; the second lot by the Evrard Railway Plant Company, at 2317l. per engine; and the third lot by the Couillet Company, at 2325l. per engine.

Some quantity of iron minerals has been sent of late into Prussia

from the neighbourhood of Venloo (Low Countries). Traces of these minerals were discovered in 1866, but it is only recently that working operations have been carried out with any vigour.

The French copper markets have not presented a very lively appearance; they seem, however, to be reviving from their lethargy. The German copper markets present a satisfactory aspect; the current of affairs is regular, and speculation is giving somewhat more animation to business. At Rotterdam prices of copper have experienced scarcely any change. At Havre there has been scarcely any movement on the market, and the other French tin markets have shown very little change. The German tin markets have been distinguished by a favourable tone. At Rotterdam there have been transactions in Banca at 81½ fls., and in Billiton at 80½ fls., the market being firm at those rates. The Dutch lead markets have not varied; in Germany, however, the article has displayed rather more animation. In zinc there has not been much change; upon the German markets transactions have been inconsiderable, but prices have displayed rather an upward tendency.

FOREIGN MINES.

The Silver Plume Mining Company have received in Liverpool their first shipment of 9½ tons of ore, per steamship Wyoming.

The Scottish Australian Mining Company half-yearly meeting will be held on Nov. 10 to declare a dividend.

The dividend for the first six months of 1871, fixed at 10 frs. per share (less 25 centimes, the French tax), will be paid in Paris this day on the shares of the Carmaux Mines Company.

ST. JOHN DEL REY.—The directors have received, per Gironde, the following report, dated Morro Velho, Sept. 29: Morro Velho produces, second division of September, 11 days, 3453 oits.; yield, 2-239 oits. per ton. Gila produces, second division of September, 11 days, 89 oits.; yield, 416 oits. per ton. The New Shaft: The second division of September, 11 days, 89 oits.; yield, 416 oits. per ton. On September 24. Both shafts were drained and sinking resumed at the date of the advice received.

DON PEDRO (Gold).—Extract from letter dated Sept. 29: Produce weighed to date, 10,946 oits.; estimate for month, 13,946 oits. Features of mine promising. General work has been excavated from No. 6, Alice's west, Canoa and Curve, and average box work (not rich) from Canoa Curve and shoot of the lode, Alice's west below level. We have encountered good work in No. 1 side level adit belonging to No. 8 shoot, which we find extends further south than we formerly thought, and will necessitate sinking main incline at a deep horizon. We have opened several fathoms on the lode gone through in the adit straight level; it is at present giving poor strike work. Samples of both this and the lode in No. 1 side level have reference to the same bodies of lode—those in Alice's west (No. 6). At the horizon of the 72 we are continuing the level in footwall of No. 6. Nothing new at the exploratory works. We have opened easterly and westerly on a sparry branch at Tambor, when grains of gold were discovered, but without any favourable result. Fair duty accomplished at middle adit.

ANGLO-BRAZILIAN (Gold).—Extract from letter dated Sept. 30: General Remarks.—Passagem: Results more and more favourable both as to raisings of ore and produce extracted. The return, however, for this month will be small, owing to our small force, but in proportion much better than has been done for some time past. The explorations on now ground are so promising that I intend increasing the force. The samplings of the small line of jactings on the main level, Buracão, and the shaft of the upper lode in Dawson's shaft that has not been touched since the cutting of Dawson's Canoa, have all given coarse gold (in a metal base), and promises a fair yield per ton. On this head I hope to write you more fully by the end of next month, as I purpose passing several hundred tons through the stamps.—Pitangui: In Hosken's level we are daily expecting the intersection of the jactings.—Vertical and Incline: Progress slow owing to the small size of shaft, besides the air at times is close and foul. Measures will be taken to erect a small fan or some other system of ventilation. This drawback will be entirely removed when they are connected.

GENERAL BRAZILIAN (Gold).—Extract from letter dated Sept. 28: The works generally continue to advance satisfactorily. At St. Anna the old adit is still in the same position. The small shaft sunk from the bottom of this level has nearly 6 ft. of water; the draining of same and shaft No. 2 for ventilation and shallow adit No. 1 is not so rapid as we could wish. We shall sink another shaft in the old adit level, one large enough to allow the working of a Californian pump, and every effort will be made to reach the shoots of gold in order to test their value. The former proprietors say they are very rich; that they followed down the shoots until they could go no further on account of the water. The shallow adit No. 1 is progressing fairly: water about 150 cubic feet per minute. The shallow adit No. 2 is advancing apace. Haymen's shaft has been resumed, and a set of timber fixed therein. At Itabira the shallow adit is a little more favourable. The middle adit is advancing, and shaft No. 2 for ventilation and shallow adit No. 1 is progressing fairly, and explorations are regularly attended to. At surface the works are progressing apace, and do not call for any particular remark by this opportunity. Health of the establishment not quite so good. Provisions plentiful, and materials abundant.

ROSSA GRANDE (Gold).—Extract from letter dated Sept. 28: At Mina da Serra we have been obliged to discontinue operations since my last, owing to increase of foul air. We left the lode small and poor, and it will, therefore, require some consideration if it would be advisable to go to the expense of sinking a shaft, which will be necessarily required here. At the Cachoeira Mine we are in a similar fix, only with considerable difficulty we are able to carry on the work, and shall not resume a shaft here again. The favourable appearance of the lode of this mine, which proved to be of a fair productive quality, has induced us to commence forthwith preparations for a shaft. The force from Mina da Serra is employed here, and surveys are now in hand for same. At the other places of operation there are no changes to report. The works are carried on with the usual regularity.

TACUAREM (Gold).—The following special report, under date of Sept. 28, has been received from Capt. W. H. Martin, who has succeeded Mr. T. S. Treloar as manager of the mine:—Soon after my arrival here I commenced a careful inspection of the underground operations, and now beg to hand you the following report:—The 25 has been opened a little east and west of Haymen's shaft on both levels. No. 1 lode, going east, is composed chiefly of iron and 1-2 spar, very hard, presenting rather an unfavourable appearance; west of the same level the character of the lode seems changing, not being so hard, containing more quartz and clay, which was considered favourable in the lode higher up near the gold shoots. Under lode No. 2, going east at the 25, is also very hard, consisting of quartz and sandstone, unproductive. In the end on the same lode west the lode is making a favourable change, and has an encouraging appearance towards the south or hanging-wall; the killas is very congenial, presenting better indications for producing gold. I have suspended for the present the ends going east, and put a full force on the western level on each lode. I have also carefully examined the lodes in the stopes below the 15, and towards the west end on No. 2 lode. I found some fair samples of gold, which lead me to believe that this is part of the gold-bearing vein which made a little below the 15; I shall lose no time in opening on it, and trust it will lead to good results. I am still of opinion that the shoots and gold-bearing veins are influenced west by soft ground, and a slight fault in the lode; this we shall soon prove. There are other points which I have scarcely had time as yet to examine thoroughly, but they shall have my attention as soon as possible. A cross-cut is being driven at the 15, but nothing as yet met with to call for remark. Operations in the deep adit have been suspended some time. A short cross-cut had been driven north about 8 fms. from the main adit, and intersected both lodes. I have carefully sampled this point also, but found no trace of gold, although the lodes are by no means unkindly. The air is very light in this level. I have placed hands to explore the backs of lodes in the curve of the mountain, about 100 fms. east of the old workings, also to clear a level on the formation adjoining the stamps, and in my next I hope to be in a position to report upon the lode at this point. General Remarks: The force both on levels and on each lode is admirably reduced. I intend at the end of the present month to make some further retrenchments in order to keep the expenses as low as possible, without diminishing the number actually engaged in mine operations. You may rely upon my exerting every possible economy—at the same time I believe some improvement may be expected in produce.

ECLIPSE (Gold).—Mr. H. Tregellas, Oct. 3: Since my last report we started the stamps, and I have great pleasure in stating that no stamps can work better. But it grieves me very much to tell you that, owing to the low state of the water in the river, we had to make our water ditch deeper, which is being done by every available person in this employ, and in eight days I hope we will have all the water we require. The river is lower than it has been for 10 years. We will now have water at all times and seasons, and I trust we will now without a doubt make good returns.—Mine: Our operations at the mine are very satisfactory; we are driving the 300 ft. level, and stopping the backs above the same; in both of which we have a good lode, and are producing quartz that will produce to my satisfaction.—Tramroad: We have laid the iron on about one-half of our tramroad, on which we shall now carry our ores to the mill. The tramroad around the side of the mountain is nearly completed, and when more iron arrives it will be laid at once.—Smelting Works: Our smelting works are progressing, and I hope will be completed within the contract time.

HENRY TREGELLAS, Oct. 24: Telegram: "Insufficient water obviated—now stamping satisfactorily—returns next week."

ENDERBURY AND AUBORA.—The directors have received a further remittance of 30 bars, valued about 7000l.

SOUTH AUBORA (Silver).—Telegram: "October bullion shipment, 27,000; in pans, 7000; estimate, 9½; expense, including supplies, 1800. No chloride bar worked yet. October expense, 4000. Cannot accept Hague's report. Will send opinions of experienced practical engineers conversant with the district." The directors have received, per steamer America, six bars of silver, value £6740-29, from their mines.

MINERAL HILL.—The directors announce the receipt, per steamer City of Baltimore, from New York, of 18 bars of silver, value \$25,061.

PACIFIC.—Henry Prideaux, Oct. 5: Since writing you this morning we have cut a very rich ledge in the bottom of the 400 ft. level; it is 12 in. wide, and the ore it is yielding is worth from \$200 to \$300 per ton. The ledge in the north cross-cut is also very wide and rich; and the ledge in and around the sump where and rise is yielding a quantity of rich ore. The mine is also getting better looking than ever I saw it before.

Oct. 9.—The quantity of ore raised during the past week is as follows:—25 cars (about 15 tons); 60 sacks (4 tons); assorted from the dump, 8 tons; total, 27 tons. The value of this ore is 2 tons \$500 per ton, 4 tons \$300 per ton, 5 tons at \$100; and the balance worth \$50 to \$70 per ton. The ledge we intersected below the 400 ft. level is 10 in. wide, and the ore without sorting is worth \$400 per ton. All other points of operation are progressing favourably, and yielding good ore. Some of the tributaries abandoned their piece of ground; they had raised 2 tons 550 lbs. of ore. We have mined this ore at the same place as the 2nd mill. The first-class, 550 lbs., assayed \$1000 per ton; second-class

2 tons, assayed \$200 per ton. The Pacific Company retains 40 per cent. of the proceeds of their ore. The quantity of ore being raised will be increased.

IMPERIAL OTTOMAN.—Capt. J. B. Champion, Pelidivi, Oct. 21: Since my last report the engine-shaft has been sunk about 2 fms.; the ground is composed of a grey stone similar to elvan, and apparently getting softer in depth; I hope in about four months to complete the sink—10 fms., which I consider a fair depth to prove the value of the lode. In driving a cross-cut north through the middle of the lode, we have intersected a flat course of lead and blende, and about 2 fms. thick, produced about 1½ ton of ore per fathom ore. As far as seen this course appears to be dipping west from the stope from No. 2 lode, as the composition, &c., is precisely the same. The men are continuing the cross-cut; the result I will let you know in my next, probably next week. The new lode continues occasionally to produce deposits of small and large stones of lead ore, and without any material alteration. We are busy preparing the blende, and hope to send several tons to Touzla next week; of the very fine we are making two parcels, and I think No. 1 will produce considerably more copper, from which it will be more valuable than blende. All our men are at work, and I trust we shall be free from any such sick work during the winter months. Everything is going on as satisfactorily, and hope it will without interruption.

UTAH (Silver).—L. Rawlings, Oct. 3: I beg to submit the following report of the workings of the company's mines for the month of September:—There has been extracted from the different lodes—Belshager, 136 tons of ore; Red Warrior, 38 tons; and Portland, 172 tons of ore. This does not include a large quantity of ore (say) 160 tons, of a low grade, which remains on the dumps. The ores of the Belshager Mine, owing to the large percentage of pyrites which they contain, must be put into two classes—first and second. The first class we are roasting in piles, by which process we can smelt it more successfully. The mine has improved very materially during the past two weeks, showing a very large quantity of fine ore dipping north-east. The Red Warrior looking well, and Belshager still being a very serious sick work during the winter months. Very little ore in sight, some good ore in dump. The main tunnel is now run 380 ft., and is being rapidly pushed forward; 330 ft. from the mouth we struck a very promising ledge, 4 ft. in width, dipping into the mountains at an angle of 45°, running north-east by south-west. We call this the "Nancarrow" ledge. The ore is principally galena, containing a very large percentage of iron pyrites, and some copper. This I consider the most important discovery we have made. Tunnel No. 2 is being run through the Portland, to get deeper on the mine, and develop the Sturges, which lies back of the Portland. In consequence of the small amount of water we encounter all the mines it renders it impossible to develop the property to any depth with the present appliances. I would, therefore, strongly recommend the importance of at once sinking a shaft and erecting good and substantial hoisting works, with pumps, &c. A considerable amount of labour has been expended upon the works, not the least important of which has been the grading and levelling for roadway, buildings, &c. This was unavoidable, as the workings of the mines and smelting-works could not be constructed without it. The work is being made more efficient and complete every day. The large new furnace is covered in, assay office and shed built, and all necessary material is being obtained before winter sets in.

COLORADO TERRIBLE.—The directors have laid before the shareholders a proposal to purchase the Brown Mine, which lies contiguous to the Terrible lode, and consists of three distinct lodes higher up the mountain, 1600 feet on the U.S. Colo lode, 1400 feet on the John Brown lode, and 3000 feet on the Glasgow lode. It also includes 800 feet on the Mammoth lode, which is supposed to be identical with the John Brown lode, but has been purchased by the owners to prevent dispute, and a tunnel site in which a tunnel has been driven a short distance striking the Glasgow lode. Mr. C. S. Richardson estimates the value of the lode to be \$642 76 c. per fathom, and the approximate cost of working \$344 per fathom, giving a gross profit of \$298 76 c. per fathom. He adds that for a long time he has advocated a consolidation of the Brown and the Terrible lodes, and is now in a position to do so, and has both companies, and has shown the many advantages that would be derived by such an amalgamation. This will become more apparent now than ever since the cross-cut tunnel has been completed to the Terrible lode. This tunnel he recommends should be continued onward to intersect the Brown lode (about 400 feet), and when effected it will form not only the medium of perfect drainage, but the line of egress for all its products, thus doing away with all hoisting, the saving alone of which is equivalent to a small dividend. In addition several small veins known to exist at surface, but which he considers to be mere branches of the two main lodes, will be intersected, which will be a very important addition to the further cost, and if productive will contribute to the general returns of the united mines. The purchase, if sanctioned by the shareholders, will not be completed, or any of the consideration paid, until the directors are satisfied by a report from Mr. George Teal, the newly-appointed agent, in whose judgment and experience they have every reason to repose confidence, that the property is as described by Mr. Moffat, and capable of yielding the returns expected from it, and until the title is examined and found complete. The directors will, therefore, call a general meeting for the purpose of considering the proposal, and for increasing the nominal capital from 125,000 to 200,000, and for adding 14,000 shares of £1 each, in order to purchase for £14,000 the Brown Mining Company's property, and provide a working capital of 10,000.

BRAZANZA (Gold).—Morro Tabac, Sept. 28: B Cross-cut: In this level there were two veins, which appeared to converge towards one point; we have worked upon both, and find them to join, making the lode at the junction 4 ft. wide; we are now rising on it to the level above cross-cut C, and we expect it will be the same as the lode found so good in that level; the samples from it produce gold, and it is expected as we approach the alide it will still improve; the stone we have been breaking is lying by, waiting to be crushed.—C Cross-cut: We have holed the rise to the level driven from the Gully, and as the lode and vein are auriferous we are in hopes that the stoping ground will be found to prove to be fair stamping ground. The lode was examined most carefully in order to detect any leakage that might exist, but found none; but for the last three miles, as soon as the last leaves the wood, the absorption and evaporation are so great that the diminution is almost visible; the soil has become so friable that it will not retain the water. This has been an exceptional season—no rain for four months. During the last two days the sky has been overcast, and we have had some thunder, so that a change may now be looked for, and that we shall have a full supply of water.

ANGLO-ARGENTINE.—Capt. Jos. Vivian reports for August:—The weather during the month has been milder; our surface operations have, consequently, proceeded more favourably. The good progress made in the construction of the stamping-mill, the framework for 36 heads fixed, and axle for the first 12 heads in its place. Arrangements for amalgamating (until the proper machinery can be erected) have been commenced, and will undoubtedly be completed as soon as we are in a position to commence stamping. The above work is being pushed on as fast as possible, in order that returns may be forthcoming at an early date. The additional piece of loading for driving gear of amalgamating machinery has been erected. In the mining department everything is progressing satisfactorily. The engine-shaft is sunk 2 fms. 1 ft.; water increasing in all of which is issuing from the bottom. The lode at the Manager continues to open out well—in fact, the backs will yield a larger quantity of ore than was at first anticipated. A number of samples have been taken indiscriminately during the month, and they all show a fair produce of gold, and in some places silver as well. The opinion I have from time to time expressed of this lode is strengthened daily. We are also extending our operations at North mine; the lode is of the same appearance and character, and large quantities of ore accumulating. The driving of the various adits and cross-cuts proceeds satisfactorily. The force is sufficient for present requirements. The health of the establishment is good.

LUSITANIAN.—Oct. 24: Palhal: In Taylor's engine-shaft, below the 140, the lode is 4 ft. wide, composed of quartz and ore, worth 1½ ton per fathom.—Levels on Basto's Lode: The 150, east of Taylor's, contains 2½ ton per fathom, composed of quartz; and the 160 west a lode 6 ft. wide, yielding ¾ ton per fathom. The lode in the 140 east is 5 feet wide, unproductive; and in the same level west it is 4 ft. wide, made up of schisto, quartz, and ore, of which latter it yields 1 ton per fathom. In the 130 west the lode is 1 ft. wide, chiefly flooken. In the 120, east of River's shaft, the lode is 4 ft. wide, composed of quartz, with stones of ore, and in the 110 east it is 2½ ft. wide, and of no value. In all of which is issuing from the bottom. The lode at the Manager continues to open out well—in fact, the backs will yield a larger quantity of ore than was at first anticipated. A number of samples have been taken indiscriminately during the month, and they all show a fair produce of gold, and in some places silver as well. The opinion I have from time to time expressed of this lode is strengthened daily. We are also extending our operations at North mine; the lode is of the same appearance and character, and large quantities of ore accumulating. The driving of the various adits and cross-cuts proceeds satisfactorily. The force is sufficient for present requirements. The health of the establishment is good.

NEW ZEALAND QUARTZ CRUSHING AND GOLD MINING COMPANY.—Jas. Thomas, Sept. 7: During the past month we have crushed for the Toketai Gold Mining Company 114 tons of quartz, giving a yield to the fortunate shareholders of 2825 oits. 10 dwts. of gold. You will observe this quantity is exceedingly rich, producing over 24 oits. of gold per ton of quartz. We have also crushed a small nominal lot from the Flying Cloud claim of 23 tons, yielding 10 oits. of returned gold. In a few days the works will be again engaged for the Toketai Company; they have expressed their entire satisfaction with the machinery, and particularly the amalgamating arrangements throughout. I anticipate there will be a gradual increase of work every month forward from this date. The mines are looking well, and some of them turning out wonderfully rich gold quartz. New companies are being formed every week for working mines on the various portions of auriferous ground, so widely distributed throughout this gold field. I am much pleased to be in a position to send you a statement of "crushing credit," and have every reason to hope it will be gradually increasing in future.—P.S. Since writing the foregoing I have met the directors of the Toketai Gold Mining Company, and made arrangements with them to crush as much quartz as they can supply us with for the next three or four weeks, which will amount to 300 or 400 tons, at 14s. per ton. They say they can keep our present machinery going constantly; if so, we shall require additional machinery erected immediately.

(For remainder of Foreign Mines see to day's Journal.)

SULPHUR MINING IN MEXICO.—Sulphur, in its compounds, principally as acid, is of such importance to the useful arts, that it is said the consumption thereof, with that of iron, can serve as an indicator of the industrial activity of a country. A few remarks on a sulphur mine in this country may, therefore, be interesting to some of your readers. The high plain extending west from Mazapil, Zac., towards the State

of Durango, elevated about 6000 feet above the sea, is mostly formed of limestone strata and clay slates, the last alternating here and there with sandstones, in which I found a few impressions of stigmatalia and stigmatalia, the only petrifactions I did find. This formation, which, near to the Rio Grande, incloses beds of bituminous coal, is here raised up, and broken through by eruptions of pliocene and volcanic rocks, forming mountain chains, low hills, or isolated sharp peaks. East of the hacienda "Las Norias," on the main road to the famous mining town of Fresnillo, the limestone is raised up by trap rock. Near to the contact line, transverse to the strata, a deposit of sulphur in gypsum occurs. In the shape of a vein, dipping 60° to west. The crystalline gypsum, of pure white colour, where it is not impregnated by sulphur, is from 20 to 60 feet thick, and incloses a vein of native sulphur from 12 inches to 3 feet wide. This sulphur is of a brownish green colour, that impregnating the gypsum of a peculiar yellow. On the upper and lower wall of the gypsum the limestone has been eaten away by the acid waters or vapours, leaving on both sides openings of more or less extent, which, by the crumbling down of debris, have again been partly filled up. In this way the gypsum and sulphur form a large sheet, standing at an inclination of 60° nearly free between the two walls. The proximity of great masses of siliceous minerals (sinter and chalcodendrite) lead to the conclusion that hot springs once existed here. The mine has been worked to a depth of about 250 feet, the levels extending more than 300 feet. The produce, during the whole time it has been worked, five or six years, is estimated at about 1000 tons of sulphur. Only the purer pieces have been made use of, and of these, not more than 40 or 60 per cent. has been extracted. The rest has been sold as a sort of sulphur go the dump. The distillation is carried on in earthen pots, of very little thickness, holding about 50 lbs. each. Those pots, of which from 10 to 15 are set in a most rudely-constructed furnace, are not only very imperfectly closed with the bottoms of old broken pots, but they are so very porous that they give a pretty free passage to the vapours. Through the carelessness of the workmen the mine has been on fire several times, but as it has only one entrance, the fire has been easily choked by dumping the door. The dump, which must have held immense quantities of sulphur, has been burnt also.—C. S. Conception del Oro, State of Zacatecas, Mexico.—Engineering and Mining Journal (New York).

MINING IN AUSTRALASIA—MONTHLY SUMMARY.

Melbourne, Sept. 9.—Our mining interest continues to prosper, and every gold field, save that of Ballarat, seems to be improving in its yield of the precious metal. Sandhurst may be said almost to have renewed its youth. Many of the established companies are giving large and frequent dividends, and many others, it is said, are on the eve of doing the same. The Sandhurst dividends paid from January, 1870, to June 30, 1871, amount to 281,887l., and of the same period amount to 1,459,000l. in stock ready for raising on the established dividend-paying companies, the balance being the aggregate of the calls on new ventures which have not yet commenced to pay. Many of the new companies at work on the celebrated Garden Gully Reef will doubtless soon be as profitable as some of the most successful of their predecessors. This state of things, as might have been expected, has attracted a new and general interest to legitimate mining adventure, which for some years before the late revival had been in a somewhat languid state.

BALHANNAH BISMUTH MINE.—At the half-yearly meeting of shareholders Captain Henkel reported that the operations had been most satisfactory, the yield of ore being fully maintained, and the lode continuing rich and productive. The 30 fm. level had been driven east, continuing in richness, with the exception of the last 2 fathoms. On driving 1 fathom further east the ore was setting in exceedingly rich, with every appearance of continuity and productivity, and pure blismuth was coming in. The lode in driving the 20 fm. level was 4 to 5 feet wide. Raising was done on tribute, the highest being 4s. in 11, the lowest 3s. 10d. It was intended to continue driving the 20 fm. level further east, the lode at surface having been already cut, and the shaft would be sunk to the 20 fm. level. It was also intended, weather permitting, to sink an engine-shaft 15 fathoms deeper, where there was considered little doubt a splendid lode would be cut. The engine was in fine working order, and would be ready for the sinking of the shaft. The ore was about 1500 tons of ore in stock ready for raising on tribute. In sinking 25 tons of ore to the fathom were exposed, and the property was held to be "one of the finest bismuth mines in the world." The directors have concluded an arrangement with Mr. G. H. Cosius to erect smelting works on the mine for reducing the ore into the blismuth of commerce at a cost of 1s. 6d. per lb.

AUSTRALIAN MINES.

YUDANAMUTANA (Copper).—The superintendent (Adelaide, Sept. 11), states: The new shaft is down to water-level, and as soon as the timbering is complete below the 35 we shall commence in good earnest to break away again. There will be difficulty in getting in wood until the teams now eating on the telegraph line shall have finished their contracts with the Government, but as we expect soon to be raising very large quantities of rich ore, and to be able to dispatch the best to Port Augusta, and hope to get wood in sufficient quantity to smelt the low-class. I have closed contracts for 2000 tons, and hope to let more.—Capt. Terrell reports, Sept. 4: Blinnan Mine: In sinking the shaft the last 10 fathoms we have cut some very nice lodes of ore, which had not been previously discovered. This, the main part of our mine, since the shaft has been down looks richer than ever, and when we commence hauling direct from the lode we shall speedily make up for all lost time.—The 35 fm. level: The lode we cut in driving to the engine-shaft at this level has turned out some splendid ore, and still looks well. The stopes still continue to yield ore in fair quantities. Ore raised and smelted, 197 tons; copper made, 15 tons 11 dwts.

SCOTTISH AUSTRALIAN.—The directors have advices from Sydney, dated Sept. 7, with reports from Lambion Colliery to the 4th. The sales of coal for the month of August amounted to 11,082 tons.

PORT PHILIP AND COLONIAL (Gold).—Clunes, Sept. 7: The quantity of quartz crushed during the four weeks ending August 16 was 4896 tons; pyrites treated, 37½ tons; total gold obtained, 1621 oits., or an average per ton of 6 dwts. 15 grs. The receipts were 6132l. 8s. 11d.; payments, 4239l. 16s. 8d.; profit, 1892l. 12s. 3d.; added to which was last month's balance of 10682l. 15s. 10d., thereby making an available balance of 29511l. 7s. 4d. The amount divided between the two companies was 15007l. The Port Phillip Company's proportion being 9575l. The balance of 14511l. 7s. 4d. was carried forward to next month's account. The following is the return for the three weeks ending September 3:—Quartz crushed, 3811 tons; pyrites treated, 18 tons; total gold obtained, 904 oits. 15 dwts., or an average per ton of 4 dwts. 18 grs.; remittance, 800l.

—Telegram, dated Galle, Oct. 28, in anticipation of the mail leaving Melbourne, Oct. 10, and due here Nov. 25: Month ending Sept. 13, yielding per ton, 5 dwts. 9 grs.; three weeks ending October 4, yield per ton, 4 dwts. 7 grs. Remittances, 7000l.

YORKE PENINSULA.—The directors have advices from the committee of inspection at Adelaide, dated Sept. 8, with reports from the Kurilla Mine to the same date.—The following are extracts from Capt. Anthony's report: Hall's Shaft: Since my last, dated 11th ultimo, the 45 fathom level has been driven 4 fms. 2 feet 6 in., total length of drive 1 fathoms 3 feet 6 in. The 3 fathoms we thought a lode, but no good ore, but it is improved, and is now 1 ft. 6 in. wide of yellow ore and quartz, or (say) 2 tons of 12 per cent. ore per fathom, after the lode is crushed and jigged. The 35 is driven during the month 4 fms. 3 feet; total length, 47 fathoms 3 ft. No ore of value has been met with, but yet we have occasional stones of high quality ore, and the general appearance of the lode is not unpromising by any means.—Deeble's Shaft: The 25 fm. level is driven west additional 2 fms. 1 foot; total length, 27 fms. 5 feet. Shortly after posting my last report the lode in this drive showed signs of good ore, the following opening to 3 feet of good yellow ore, which, unlike the ore previously seen here, rose to the back of the level. Since, however, the ore part of the lode has again dipped, leaving the back comparatively poor, but the bottom is fair tribute ground. The ore is again rising, there being a good stone of ore reaching the back, average yield 2 tons of 15 per cent. ore per fathom. The last 10 to 11 fathoms of this drive have laid open a paying lode in the bottom, indicating most unmistakably a run of ore ground below.

ENGLISH AND AUSTRALIAN (Copper).—Port Adelaide, Sept. 11: The quantity of coal at Port Adelaide was 385 tons. The manager writes: "The furnaces are out, and while the masons are putting them in repair the slags and cobbing are being sorted, and in another week I hope to get the stock of fuel supplied, and the furnaces at work again." The 50 tons of copper advised by the last mail in course of shipment had been shipped, and freight for a further quantity of 134 tons had been secured.

AUSTRALIAN UNITED (Gold).—The directors have received advices from Mr. Kitto to Sept. 9, in which he states that the Duke of Cornwall Mine has been sold to a local company for 14,000l. cash, which, he says, after paying all the liabilities of the company, will leave 2000l. to carry on the Central Mine. He adds as follows:—"I need scarcely state that I have, in all the proceedings detailed above, worked to the best of my ability in the interest of the company, and I desire that the shareholders will be made clearly to understand that a property which can be sold locally for 14,000l. is one not entirely unworthy their attention and consideration. I am very much pleased to say that should you carry out your scheme for reconstruction, the company's affairs may yet be flourishing, as, should I succeed in developing a rich gutter at the Central, many opportunities may arise for my securing for the company another quartz mine in lieu of that which is lost."

ANGLO-AUSTRALIAN (Gold).—The directors have received advices to Sept. 9. Mr. Kitto writes:—"The sale of the Duke of Cornwall Mine to local men for (comparatively) such a large sum should encourage the shareholders to persevere. The gentlemen who agreed to purchase the Duke only did so after visiting the cross-cut in No. 2 (west) shaft at our mine, at which point the lode was branched, or cap as it is called here, of the main lode has been seen. I may remark that the Sandhurst men conducted me so good a prospect in view for my English co-shareholders. Capt. Ralbeck's report will afford detailed information. Quartz mines in the colony are rapidly increasing in value." Mr. Lamb writes:—"I trust that our having struck an auriferous lode at the Anglo, and the fact that, in our extremity at the Duke, colonial capitalists have been found willing to give 14,000l. for the mine, will give that confidence to the shareholders which all our efforts have hitherto failed in doing, apparently. The worst I wish the most sceptical of them is that they had been in the Van der Cappel Ralbeck's mine. West Shaft (No. 2): I have an honour to report progress in the mine since July 29. On the above date the engine and pumps in west shaft (No. 2) being completed, we commenced to pump out the water, which was effected on the 31st; and on the following day (Aug. 1) we commenced to open out on the west side of shaft for a plat and cross-cut to the west, to intersect the gold-bearing quartz we had struck in the shaft; and when the August mail left we had driven a distance of 20 feet. At a distance of 33 feet we touched the eastern flooken, with quartz on the west side, underlying west 5 feet in the eastern flooken, and the next 20 feet consisted of broken country (quartz, sandstone, and slate); we then struck stone, in which gold was freely seen; width of stone about 4 feet. Another 4 feet of fine slate, when we struck the western lode, underlying east 2 feet in a fathom. We drove through this lode for 5 feet, and could see gold frequently, more particularly for about 2 feet on the eastern side of the stone. As we are apparently on the 'cap' of the lode it is thought advisable to sink the shaft an additional 60 feet, in order to thoroughly test its value. The present length of cross-cut is 60 feet. The sinking of the shaft will be commenced on Monday next."

LONDON GENERAL OMNIBUS COMPANY.—The traffic receipts for the week ending October 29 were 9464l. 8s.

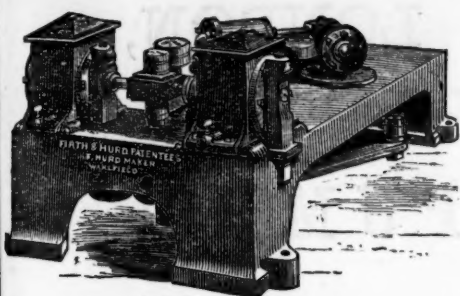
F. HURD, ENGINEER,

MILLWRIGHT, MACHINIST,

BRASS AND IRON FOUNDER,

ALBION FOUNDRY,

WAKEFIELD.



Patent Air-Compressing Engine.

MANUFACTURER

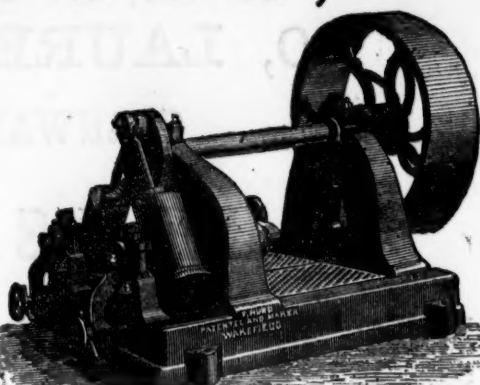
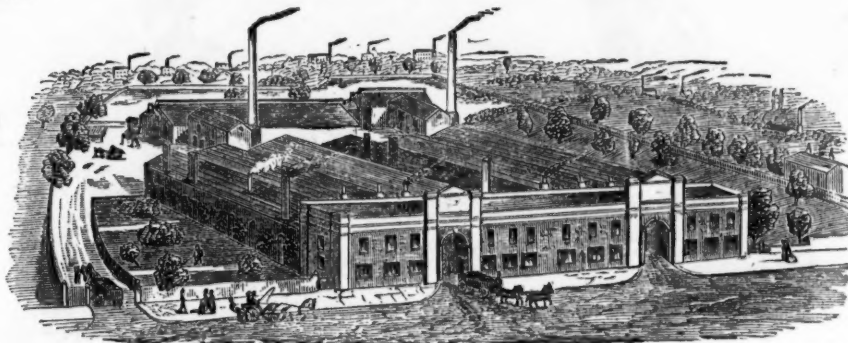
of PATENT MINING and
EXCAVATING
MACHINERY.

FIRTH'S PATENT

CANNEL

HUB

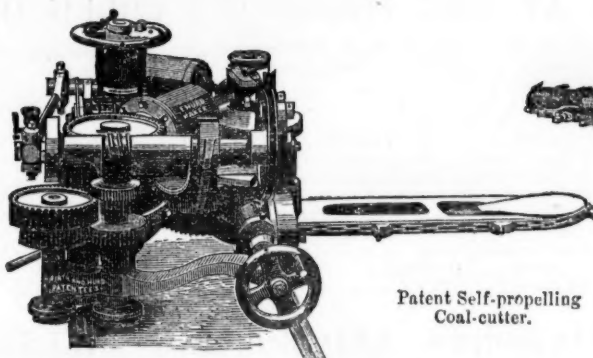
DRESSER.



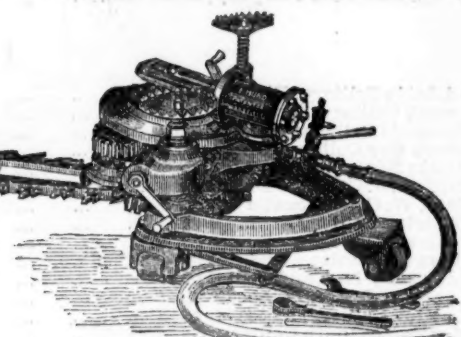
Patent High-speed Reversible Engine, without the aid of Tappets, Cams, or Eccentrics. Cylinders either fixed or oscillating.

HYDRAULIC and AIR-
COMPRESSING

MACHINERY. Heavy, Light,
and Ornamental CASTINGS,
and Patent
WORSTED MACHINERY.



Patent Self-propelling
Coal-cutter.



Patent Power Pillar and Stall Work
Coal-Cutting Machine.

Patent Power, or Hand Straight Work
Coal-Cutting Machine.

Also, FIRTH'S PATENT ECONOMIC PERMANENT RAILWAY, without the aid of Pins, Bolts, or Wedges, that can be laid by an ordinary labourer with rapidity.

GENERAL CONTRACTOR; and Estimates given for Air-Compressing Machinery and Coal-Cutting Machinery on application.

AWARDED TWENTY GOLD AND SILVER FIRST-CLASS PRIZE MEDALS.

IMMENSE SAVING OF LABOUR.

TO MINERS, IRONMASTERS, MANUFACTURING CHEMISTS, RAILWAY COMPANIES, EMERY AND
FLINT GRINDERS, MCADAM ROAD MAKERS, &c., &c.

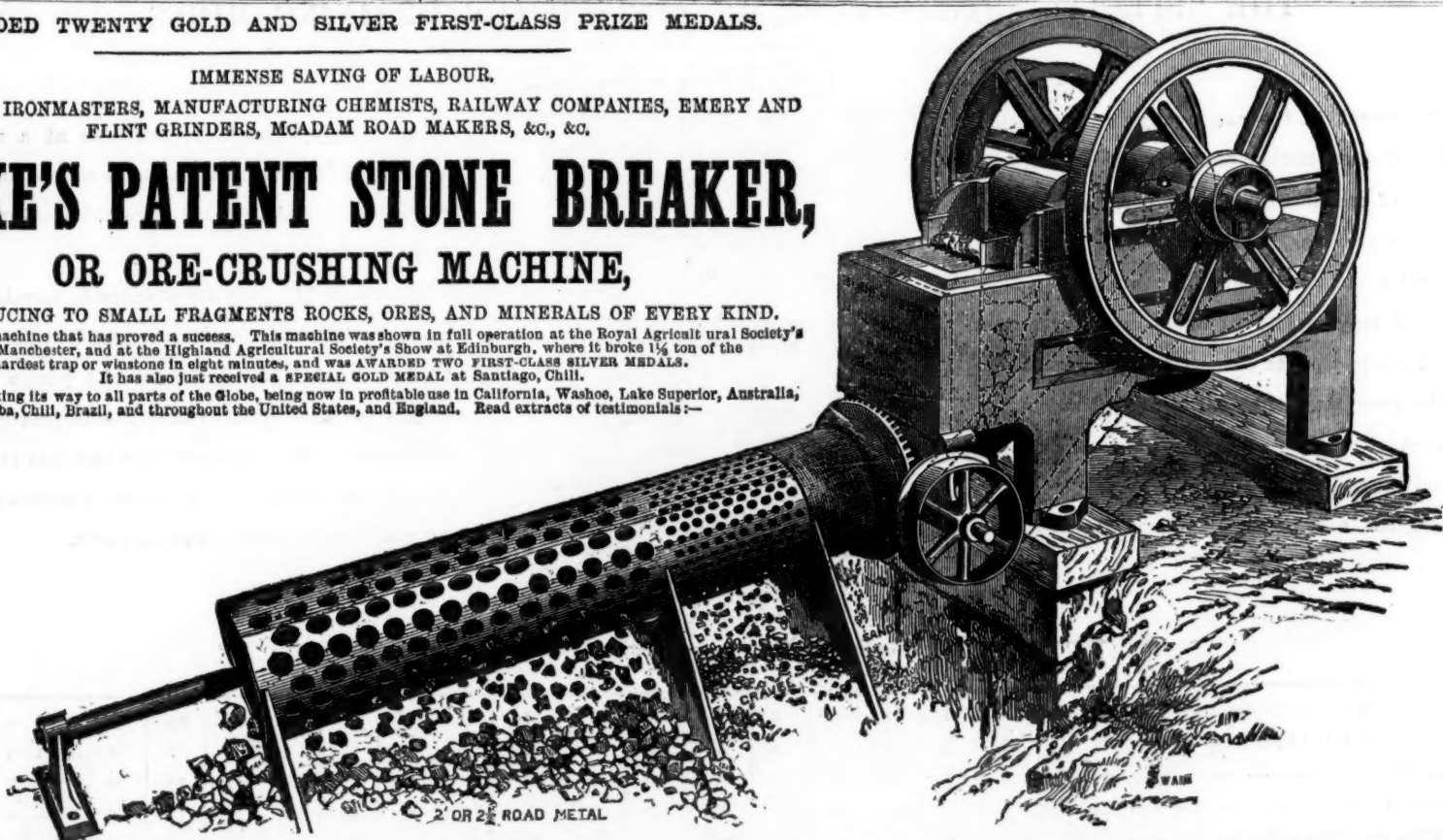
BLAKE'S PATENT STONE BREAKER, OR ORE-CRUSHING MACHINE,

FOR REDUCING TO SMALL FRAGMENTS ROCKS, ORES, AND MINERALS OF EVERY KIND.

It is the only machine that has proved a success. This machine was shown in full operation at the Royal Agricultural Society's Show at Manchester, and at the Highland Agricultural Society's Show at Edinburgh, where it broke 1½ ton of the hardest trap or winstone in eight minutes, and was AWARDED TWO FIRST-CLASS SILVER MEDALS.

It has also just received a SPECIAL GOLD MEDAL at Santiago, Chili.

It is rapidly making its way to all parts of the Globe, being now in profitable use in California, Washoe, Lake Superior, Australia, Cuba, Chili, Brazil, and throughout the United States, and England. Read extracts of testimonials:—



JAMES WILLIAMS.

Alkali Works, near Wednesbury.—I at first thought the outlay too much for so simple an article, but now think it money well spent. WILLIAM HUNT.

Welsh Gold Mining Company, Dolgelly.—The stone breaker does its work admirably, crushing the hardest stone and quartz. WM. DANIEL.

Our 15 by 7 in. machine has broken 4 tons of hard winstone in 20 minutes, for fine road metal, free from dust. Messrs. ORD and MADDISON, Stone and Lime Merchants, Darlington.

Kirkless Hall, near Wigan.—Each of my machines breaks from 100 to 120 tons of limestone or ore per day (10 hours), at a saving of 4d. per ton. JOHN LANCASTER.

Ovoca, Ireland.—My crusher does its work most satisfactorily. It will break 10 tons of the hardest copper ore stone per hour. WM. G. ROBERTS.

General Fremont's Mines, California.—The 15 by 7 in. machine effects a saving of the labour of about 30 men, or \$75 per day. The high estimation in which we hold your invention is shown by the fact that Mr. Park has just ordered a third machine for this estate. SILAS WILLIAMS.

Your stone breaker gives us great satisfaction. We have broken 101 tons of Spanish pyrites with it in seven hours. H. H. MARSDEN, Esq. EDWARD AARON, Weston, near Buncrana

For illustrated catalogue, circulars, and testimonials, apply to—

H. R. MARSDEN, SOHO FOUNDRY,

MEADOW LANE, LEEDS,

ONLY MAKER IN THE UNITED KINGDOM.

TANGYE BROTHERS AND HOLMAN,

10, LAURENCE POUNTNEY LANE, LONDON,

CORNWALL WORKS (TANGYE BROTHERS), BIRMINGHAM,

SOLE MAKERS OF

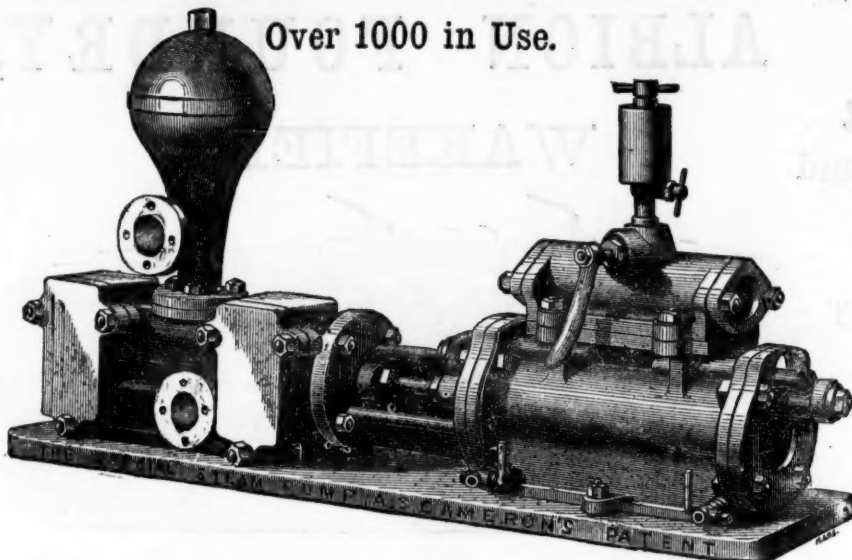
THE "SPECIAL" STEAM PUMPS.

IN USE AT THE FOLLOWING QUARRIES:—

Carnarvon and Bangor Slate Co. ...	5 Pumps.
Kellow, J. E., North Wales Slate Co. ...	1 "
New Zealand Quartz Crushing and Gold Mining Company ...	1 "
Scott, R. W., Dungannon, Ireland ...	1 "
Foster, J. S., Hebburn Quarries ...	1 "

IN USE AT THE FOLLOWING CHEMICAL WORKS:—

Alum and Ammonia Co., Bow Common ...	2 Pumps.
Barnes, W. O., Hackney Wick ...	2 "
Burt, Boulton, and Hayward, Tar Works, Millwall ...	1 "
Cory and Co., Manor-street, Old Kent-road ...	2 "
Whiffen, Thomas, Battersea ...	1 "
Jones, W., and Co., Middlesborough ...	4 "
Jarrow Chemical Co., South Shields ...	1 "
Richardson, J. G. and N. H., Jarrow-on-Tyne ...	1 "
Read, Holliday, & Sons, Huddersfield ...	1 "
Sheldon, Nixon, and Co., West Jarrow ...	2 "
Tennant, C., and Co., near Newcastle ...	7 "
Webb, H., & Co. (Manure), Worcester ...	1 "
Union Chemical Company, Stratford ...	1 "



Over 1000 in Use.

NOTE,

Requires NO Shafting, Gearing, Riggers, or Belts.

All Double-Acting:

Works at any Speed, and any Pressure of Steam.

Will Force to any Height.

Delivers a constant stream.

Can be placed any distance away from a Boiler.

Occupies little space.

Simple, Durable, Economical.

IN USE AT THE FOLLOWING COLLIERIES:—

Adelaide Colliery, Bishop Auckland ...	3 Pumps.	North Bitchburn Colliery, Darlington ...	2 Pumps.	Stott, James, and Co., Burslem ...	1 Pump.
Acomb Colliery, Hexham ...	1 "	Newton Cap Colliery, Darlington ...	1 "	Seaton Delaval Coal Company, near Newcastle ...	1 "
Blackfell Colliery, Gateshead ...	1 "	Normanby Mines ...	1 "	Thornley Colliery, Ferryhill ...	1 "
Black Boy Colliery, Gateshead ...	1 "	Oakenshaw Colliery ...	1 "	Thompson, John, Gateshead ...	2 "
Castle Eden Colliery ...	2 "	Pease's West Colliery ...	2 "	Trimdon Grange Colliery ...	1 "
Crofton, J. Ct., near Ferryhill ...	1 "	Pease, J. and J. W., near Crook ...	5 "	Tudhoe Colliery ...	4 "
Carr, W. O., Newcastle ...	4 "	Pease, J. and J., Brandon Colliery ...	1 "	Vobster and Mells Colliery ...	2 "
Etherley Colliery ...	1 "	Pegwood Colliery, near Morpeth ...	2 "	Widdington Colliery, Morpeth ...	2 "
Gidlow, T., Wigan ...	3 "	Pelton Fell Colliery ...	1 "	Whitworth and Spennymoor Colliery ...	3 "
Haswell, Shotton, and Easington Coal Co. ...	2 "	Railey Fell Colliery, Darlington ...	1 "	Westerton Colliery, Bishop Auckland ...	1 "
Lochgelly Iron and Coal Company ...	1 "	Right Hon. Earl Durham, Fence Houses ...	1 "	Wardley Colliery, Gateshead ...	1 "
Leather, J. T., near Leeds ...	2 "	Skelton Mines ...	1 "	Westminster Brymbo Coal Company ...	2 "
Lumley Colliery, Fence Houses ...	1 "	South Benwell Colliery ...	4 "	Weardale Coal and Iron Company ...	5 "
Monkwearmouth Colliery, Sunderland ...	1 "	St. Helens (Tindale) Colliery ...	1 "		

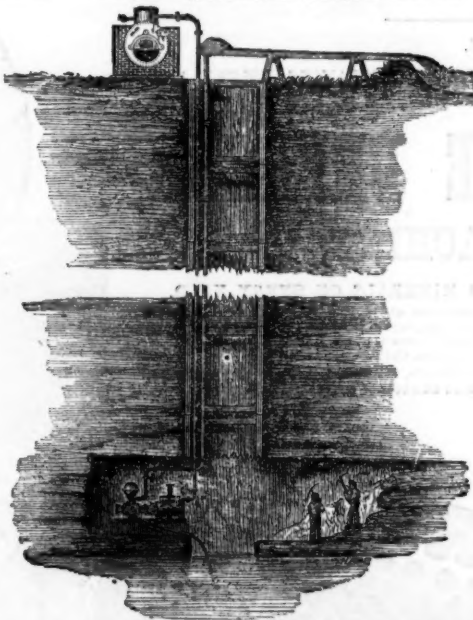
IRONWORKS AND ROLLING MILLS:—

Bede Metal Company, Jarrow ...	11 Pumps.	Gilkes, Wilson, Pease, and Co., Middlesboro' ...	2 Pumps.	Whitwell and Co., Stockton ...	3 Pumps.
Bagnall, C. and T., Grosmont Ironworks ...	2 "	Lloyd and Co., Middlesborough ...	1 "	Whessoe Ironworks, Darlington ...	1 "
Consett Ironworks ...	2 "	Solway Hematite Iron Company, Maryport ...	1 "	West Cumberland Hematite Iron Company ...	1 "
Castleford Foundry Company, Normanton ...	1 "	Vaughan, Thomas, Middlesborough ...	2 "	Westbury Iron Company ...	1 "
Ellen Rolling Mills, Maryport ...	1 "	The Shotts Iron Company, Edinburgh ...	1 "		

THE "SPECIAL" STEAM PUMP AS APPLIED FOR DRAINING MINES.

The arrangement in the accompanying illustration shows an economical method of draining mines without the expense of erecting surface-engines, fixing pump-ropes, or other gearing. A boiler adjacent to the pit's mouth is all that is necessary on the surface; from thence steam may readily be taken down, by means of a felted steam-pipe, to connect the pump with the boiler. The pump may be placed in any situation that may be convenient for working it, and connecting the steam, suction, and delivery pipes.

These engines can be fixed and set to work in a



comparatively short time, and also at a very small outlay. They are used in large mines as auxiliary engines, and will be found invaluable adjuncts in all mining operations.

To estimate the quantity of water to be raised by any given size of pump refer to the tabulated list below. It is recommended to use long-stroke pumps where the height exceeds 100 ft., so that the largest result may be obtained with a minimum wear and tear of the pump pistons and valves. The pumps are provided with doors for ready access to all working parts.

PRICES OF THE "SPECIAL" STEAM PUMPS.

Diameter of Steam Cylinder	2 1/2	3	4	4	6	6	7	7	7	8	8	8	8	10	10	12	12	14	16	26
Diameter of Water Cylinder	1 1/2	1 1/2	2	4	3	4	6	5	6	7	4	6	7	8	6	7	8	10	8	7
Length of Stroke	6	9	9	12	12	12	12	12	12	12	12	12	18	12	12	18	24	48	24	72
Strokes per minute	100	100	70	50	50	50	50	50	50	50	50	50	35	50	50	35	—	—	—	—
Gallons per hour	310	680	815	3250	1830	3250	7330	5070	7330	9750	3250	7330	9750	13,000	7330	9750	13,000	—	—	—
PRICE	£10	£15	£20	£35	£30	£40	£47 10	£50	£52 10	£57 10	£50	£55	£65	£85	£70	£80	£100	—	—	—

IF BRASS LINED, OR SOLID BRASS OR GUN-METAL WATER CYLINDERS, WITH COPPER AIR VESSELS, EXTRA, ACCORDING TO SIZE.

Any Combination can be made between the Steam and Water Cylinders, provided the Lengths of Stroke are the same, thus—8 in. Steam and 3 in. Water, or 10 in. Steam and 3 in. Water, adapted to height of lift and pressure of steam, and so on.

TANGYE BROTHERS & HOLMAN, 10, Laurence Pountney-lane, London, E.C.